COUNTY EXPERIMENT FARMS IN OHIO

ANNUAL REPORTS FOR 1915

OHIO
Agricultural Experiment Station

WOOSTER, OHIO, U. S. A., SEPTEMBER, 1916

BULLETIN 303

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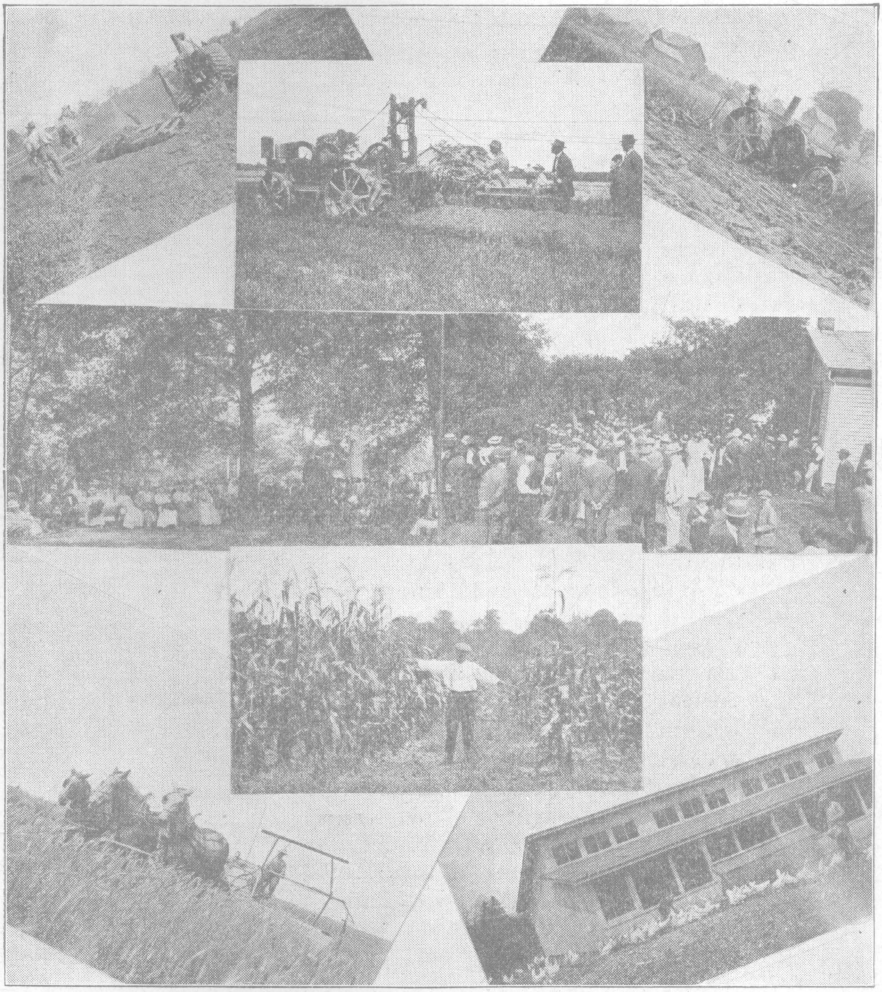


Operations and meetings on the county experiment farms

BULLETIN
OF THE
Ohio Agricultural Experiment Station
NUMBER 303 SEPTEMBER, 1916

COUNTY EXPERIMENT FARMS IN OHIO

ORGANIZATION

For convenience of administration the county experiment farms in Ohio are organized in the Department of Farm Management of the Experiment Station. The chief of that department visits the different farms at frequent intervals, and has full authority in their management, under the director of the Station.

In counties having an agricultural agent, this person has been acting as local superintendent of the county experiment farm, the Experiment Station paying a part of his salary in consideration of this service. In some counties the agricultural agent lives on the experiment farm, using that as his headquarters, and in others he lives at the county seat and visits the farm frequently. The immediate management of the farms is in the hands of working foremen, who are expected to lead in the work and to execute the work assigned to their respective farms.

This work is planned at the Experiment Station by the various department chiefs in consultation with the chief of the Department of Farm Management. The chief in agronomy is therefore responsible for the general plan of the cultural and variety tests on the county experiment farms; the chief in animal husbandry, for the experiments in meat and wool production and with poultry; the chief in horticulture, for the horticultural work; and the chief in soils, for the experiments with fertilizers and manures. Under this system each county experiment farm becomes in fact an integral part of the Ohio Agricultural Experiment Station and a participant in its work.

The annual results of the work of all the county experiment farms are brought together here in a single bulletin in order to facilitate comparisons. No single farm can adequately represent

all the soils of a county, and it will often happen that a farm located in some other county will more fully meet the soil conditions of a particular farmer than the one in his own county.

Previous publications in this series have been:

Bulletin 241, 1912, County Experiment Farms in Ohio (First Report).
Bulletin 256, 1913, Miami County Experiment Farm, Second Annual Report.
Bulletin 258, 1913, Paulding County Experiment Farm, Second Annual Report.
Bulletin 272, 1914, Hamilton County Experiment Farm, Second Annual Report.
Bulletin 273, 1914, Paulding County Experiment Farm, Third Annual Report.
Bulletin 274, 1914, Miami County Experiment Farm, Third Annual Report.
Bulletin 275, 1914, Clermont County Experiment Farm, Second Annual Report.
Bulletin 286, 1915, County Experiment Farms in Ohio, Annual Reports for 1914.

The district experiment farms receive no support from the counties in which they are located, but are regarded simply as outlying fields of the main station; and most of their work is reported in connection with similar work of the main station. Separate reports have been made upon the work of the Southwestern Test Farm (Germantown) in Bulletins 156, 206, 238, 239, 285 and Circulars 59 and 156 and upon that of the Northeastern Test Farm (Strongsville) in Bulletin 260.

DEPARTMENT OF FARM MANAGEMENT

ANNUAL REPORT

C. W. MONTGOMERY

The work for the year on the various district and county experiment farms has been a continuation of that previously reported, and in addition the following new work has been undertaken:

Northeastern Test Farm (Strongsville): Testing varieties of corn, oats and wheat; rate of seeding wheat.

Northwestern Test Farm (Findlay): Methods of seeding alfalfa.

Southeastern Test Farm (Carpenter): Seeding alfalfa with wheat, effect on alfalfa of heavy and light applications of phosphorus with lime.

At the Paulding County Experiment Farm in the 2-year rotation of corn and oats, sweet clover is being sown in the oats to compare with mammoth clover and common red clover to plow down for the improvement of the land.

At the Hamilton County Experiment Farm the herd of cows has been increased to 12, and oats and Canada peas are being tested as a crop to be grown for hay.

At the Clermont County Experiment Farm a method is being tried of increasing the crop-producing power of poor land by selling the grain and retaining the crop residues on the land and supplementing these residues with acid phosphate, floats and lime. A flock of 200 single comb White Leghorn hens has been put in, and accounts of cost of labor and feed and receipts from the flock are being kept.

At the Trumbull County Experiment Farm a dairy herd of 20 cows has been put in, and the work of breeding up a healthy and profitable herd has been started. Owing to the excessive rainfall this spring some of the rotation and fertility work has not yet been started.

At the Mahoning County Experiment Farm the land selected for fertility work and variety cereal work has been tiled, and some crops have been planted. An orchard of about 8 acres has been set out.

A cost-accounting system has been established on all the farms with a view to determining the cost of permanent improvements, and on some of the farms the cost of producing crops and the distribution of labor in various rotations is being studied.

As the beautification of home and farmstead is an important factor in the improvement of country life, some work along this line has been begun and will be continued when funds and labor are available.

Some statistical investigations have been made with a view to ascertaining how far the statistical reports of township assessors can be relied upon as giving a correct agricultural history of the townships and individual farms. So far these investigations would seem to indicate that some improvement should be made in taking statistical data.

Types of farming in vogue in given sections have been studied in a limited way and will be continued.

A few small farms have been studied and so far the leading enterprise found on these farms has been poultry.

For the coming year it is proposed to continue the work started in the past and to take up the following new projects:

In such a district as that in which the Northeastern Test Farm is located, owing to the proximity of the city of Cleveland and the improvement of the country roads by macadamizing and paving, land advances in value beyond the possibility of paying dividends

on investment by ordinary farming, and the subject of intensive farming becomes important. High-priced lands kept in pasture do not yield sufficient revenue.

It is proposed to start a dairy on the Northeastern Test Farm and a cropping system in which much of the crops grown will be put in the silo and the silage will be used for summer and winter feeding.

We have no means of knowing to what extent the results developed at the Southeastern Test Farm have been adopted in that district, aside from the fact that 225 bushels of wheat grown on the farm in 1915 was sold to farmers of the district for seed. To gain information on this subject the resident manager has been making some farm surveys and will continue this work.

Marketing methods in vogue in the counties where district and county experiment farms are located will be studied.

THE MIAMI COUNTY EXPERIMENT FARM

FIFTH ANNUAL REPORT, FOR THE YEAR 1915

G. R EASTWOOD, AGENT IN CHARGE
PEARL JONES, FARM FOREMAN

THE WORK OF THE YEAR

DEPARTMENT OF FARM MANAGEMENT

PERSONNEL

In August, 1915, M. C. Thomas resigned as county agricultural agent of Miami County, and George R. Eastwood was appointed to succeed him.

FARM IMPROVEMENTS

The matter of beautifying the farm has been taken up in a limited way. A grove has been set out and as much shrubbery planted as funds available would permit.

THE MAINTENANCE OF SOIL FERTILITY

DEPARTMENT OF SOILS

Five rotations are in progress on the Miami County Experiment Farm; namely:

Rotation I: Corn, oats, wheat, clover.
Rotation II: Corn, soybeans, wheat, clover.
Rotation III: Corn, corn, oats, clover.
Rotation IV: Tobacco, wheat, clover.
Rotation V: Corn, wheat, clover.

Rotations I to III were begun in 1911; Rotation IV was started in 1912, and Rotation V in 1915. All these rotations are so arranged that each crop is grown every season.

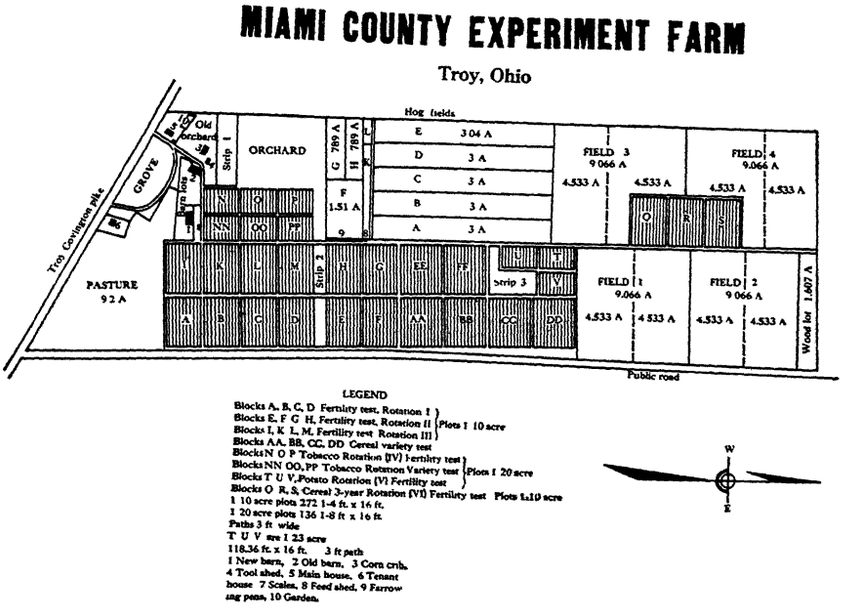


Diagram I.—Plan of Miami County Experiment Farm.

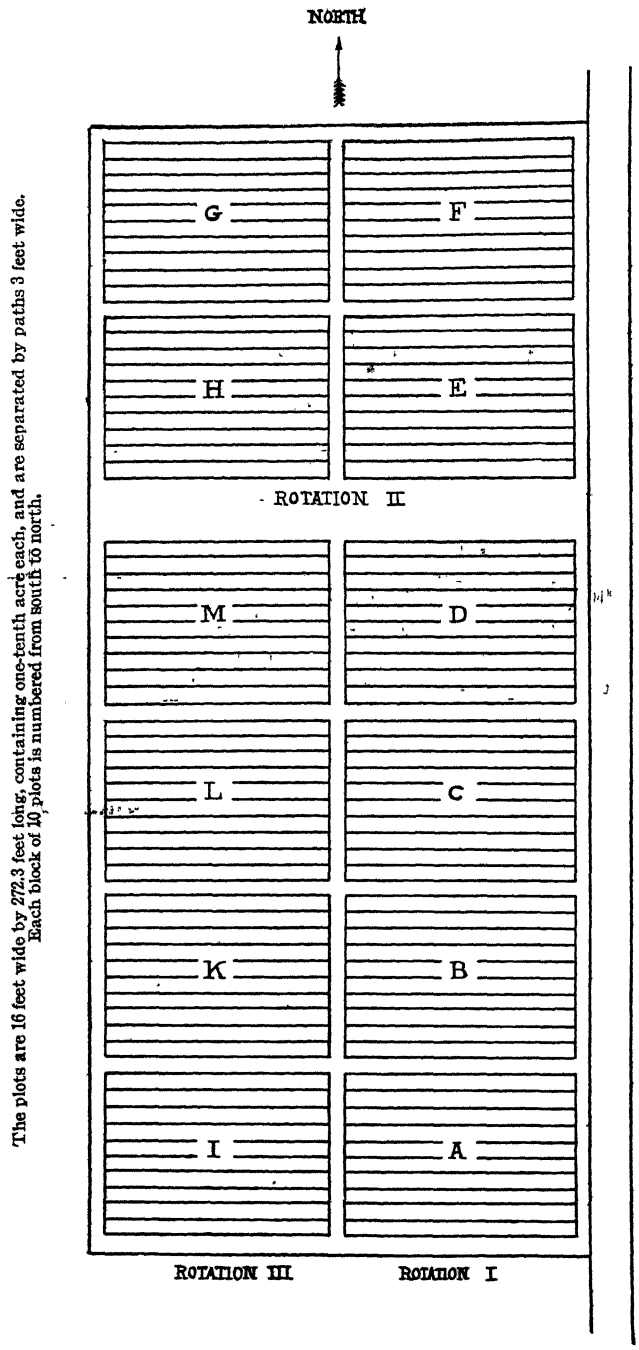


Diagram II.—Arrangement of plots, Miami County Experiment Farm

In Diagram II is shown the arrangement of the plots in Rotations I, II and III. Rotations IV and V each comprise three 10-plot blocks. The plan of fertilizing is shown in Tables I and II.

TABLE I.—Plan of fertilizing, Miami County Experiment Farm

Pounds of fertilizing materials per acre for each crop

Plot	Acid phosphate	Muriate potash	Nitrate soda	Powdered limestone	Acid phosphate	Muriate potash	Nitrate soda	Acid phosphate	Muriate potash	Nitrate soda
	Rotation I: Corn-oats-wheat-clover									
	On Corn				On Oats			On Wheat		
1										
2	200				100			200		
3	200	50			100	20		200	20	
4										
5	200	50	50		100	20	30	200	20	80
6	200	50	50	*4,000	100	20	30	200	20	80
7										
8	Manure, 8 tons							200	50	50
9	Manure, 8 tons, phosphated †							200	50	50
10										
	Rotation II: Corn-soybeans-wheat-clover									
	On Corn				On Soybeans			On Wheat		
1										
2	200				100			200		
3	200	50			100	20		200	20	
4										
5	200	50	50		100	20	30	200	20	80
6	130	50	20		70	20	10	160	20	20
7										
8	160	20	20		100			170		30
9	160	20	20	‡	100			170		30
10										
	Rotation III: Corn-corn-oats-clover									
	On Corn 1st				On Corn 2d			On Oats		
1										
2	200				200			100		
3	200	50			200	20		100	20	
4										
5	200	50	50		200	20	80	100	20	30
6	200	50	50	*4,000	200	20	80	100	20	30
7										
8	Manure, 8 tons				200	50	50			
9	Manure, 8 tons, phosphated †				200	50	50			
10										
	Rotation IV: Tobacco-wheat-clover				Rotation V: Corn-wheat-clover					
	Fertilizer all on Tobacco				On Corn			On Wheat		
1										
2	480				200			200		
3	480	180			200	50		200	20	
4										
5	480	180	240		200	50	50	200	20	80
6	480	180	240	2,000	200	50	§50	200	20	80
7										
8	240	90	120		Manure, 8 tons			400		
9	Manure, 10 tons, phosphated †				Manure, 8 tons, phos. †			400		
10										

*2,000 pounds in 1912. †40 pounds acid phosphate per ton of manure. ‡Catch crop to follow corn. §4,000 pounds of limestone added.

TABLE II.—Plan of fertilizing, Miami County Experiment Farm. Total fertilizing materials for one rotation; constituents and percentage composition

Plot	Total fertilizing materials for one rotation (pounds)				Fertilizing constituents contained (pounds)			Percentage composition		
	Nitrate soda	Acid phosphate	Muriate potash	Total	Ammonia	Phosphoric acid	Potash	Ammonia	Phosphoric acid	Potash
Rotation I: Corn-oats-wheat-clover										
2	.....	500	.....	500	.....	70	.....	.....	14	.....
3	.....	500	90	590	.....	70	45	.....	12	7
5	160	500	90	750	30	70	45	4	9.5	6
6	160	500	90	*750	30	70	45	4	9.5	6
8	50	200	50	†300	130	76	105	.....	.....	.....
9	50	200	50	‡300	130	110	105	.....	.....	.....
Rotation II: Corn-soybeans-wheat-clover										
2	.....	500	.....	500	.....	70	.....	.....	14	.....
3	.....	500	90	590	.....	70	45	.....	12	7
5	160	500	90	750	30	70	45	4	9.5	6
6	50	360	90	500	9.5	50	45	2	10	9
8	50	430	20	500	9.5	60	10	2	12	3
9	50	430	20	500	9.5	60	10	2	12	2
Rotation III: Corn-corn-oats-clover										
2	.....	500	.....	500	.....	70	45	.....	14	.....
3	.....	500	90	590	.....	70	45	.....	12	7
5	160	500	90	750	30	70	45	4	9.5	6
6	160	500	90	*750	30	70	45	4	9.5	6
8	50	200	50	†300	130	76	105	.....	.....	.....
9	50	200	50	‡300	130	110	105	.....	.....	.....
Rotation IV: Tobacco-wheat-clover										
2	.....	480	.....	480	.....	67	.....	.....	14	.....
3	.....	480	180	660	.....	67	90	.....	10	14
5	240	480	180	900	45	67	90	5	7.5	10
6	240	480	180	900	45	67	90	5	7.5	10
8	120	240	90	450	23	34	45	5	7.5	10
9	.....	.....	.....	§	150	116	100	.....	.....	.....
Rotation V: Corn-wheat-clover										
2	.....	400	.....	400	.....	56	.....	.....	14	.....
3	.....	400	70	470	.....	56	35	.....	12	7
5	130	400	70	600	24	56	35	4	9.5	6
6	130	400	70	600	24	56	35	4	9.5	6
8	.....	400	.....	†400	120	104	80	.....	.....	.....
9	.....	400	.....	‡400	120	138	80	.....	.....	.....

*With 2 tons limestone dust. **With 1 ton limestone dust. †With 8 tons untreated manure. ‡With 8 tons phosphated manure. §With 10 tons phosphated manure.

Cropping in 1913, 1914 and 1915

	Rotation I	Rotation II	Rotation III
1913	Block D—Corn	Block E—Corn	Block I—Corn 1st
	" C—Oats	" H—Soybeans	" M—Corn 2d
	" B—Wheat	" G—Wheat	" L—Oats
1914	Block D—Oats	Block E—Soybeans	Block I—Corn 2d
	" C—Wheat	" F—Corn	" M—Oats
	" B—Clover	" G—Clover	" L—Clover
	" A—Corn	" H—Wheat	" K—Corn 1st
1915	Block B—Corn	Block G—Corn	Block L—Corn 1st
	" A—Oats	" F—Soybeans	" K—Corn 2d
	" D—Wheat	" E—Wheat	" I—Oats
	" C—Clover	" H—Clover	" M—Clover

The topography of this farm, like that of much of the county, is almost flat. The surface soil is the yellow clay with dark-colored to black depressions which characterize much of the Miami series of soils, and it was difficult to find a large enough area of either the yellow or the dark-colored soil to contain an entire series of plots. When first brought under cultivation the dark-colored soil in this series is much more productive than the yellow land, but experience has shown that drainage and cultivation with systematic growing of clover in rotation tend to reduce the differences between the two types of soil. By the frequent repetition of check plots in these experiments we are able to secure results which in a general way exhibit the outcome of the treatment and which will become more definite as the work progresses.

The yields for 1915 and for the average of the period since the work was begun are shown in Tables III to IX.

Fertilizers and manure on corn.—Table III shows that in every case except one acid phosphate has produced a marked increase in the corn crops, the average increase in the three 4-year rotations for 200 pounds of acid phosphate per acre being 9½ bushels. The exceptional case is the 3-year rotation of corn, wheat and clover, begun in 1915, in which the low yield on the land receiving acid phosphate alone is undoubtedly due to variation in the soil.

The addition of muriate of potash to the acid phosphate has in every case increased the yield, the gain in the four trials that have been longest continued being 2.19 bushels per acre for 50 pounds of muriate of potash, or enough to pay for the muriate of potash with a considerable margin to spare at ordinary prices for this salt.

The further addition of nitrate of soda has thus far shown no advantage in any case, the yields from the fertilizer containing the nitrate being smaller in some cases than those from the acid phosphate and muriate of potash alone. In these experiments the corn is grown on clover sod in every case except the second crop in Rotation II, and the clover is apparently furnishing all the nitrogen required.

The manured corn in every case shows a larger yield than that obtained from fertilizers, but Table II shows that the manure furnishes a much larger quantity of the fertilizing elements than the chemical fertilizers as used in these experiments. The yield of corn has been larger after the phosphated than after the untreated manure in every case, although the calculated increase is slightly smaller in one case.

TABLE III, Part 1.—Fertilizers and manure on CORN, Miami County Experiment Farm

Plot	Treatment per acre	1915				5-year average				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	
	Rotation I: Corn-oats-wheat-clover. Block B									
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	34.29	1,675	.....	.....	42.50	2,183	.....	.....	1
2	Acid phosphate, 200 lb	56.07	2,575	21.31	842	53.99	2,405	11.00	232	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	55.36	2,400	20.12	608	55.81	2,634	12.35	470	3
4	None	35.71	1,850	.....	.....	43.94	2,154	.....	.....	4
5	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.	45.36	2,425	12.62	700	54.33	2,551	10.20	369	5
6	Acid phos., 200 lb.; mur. potash 50 lb.; nit. soda, 50 lb.; powdered limestone, 4,000 lb	36.79	2,175	7.03	575	53.83	2,619	9.70	410	6
7	None	26.79	1,475	.....	.....	44.23	2,237	.....	.....	7
8	Untreated manure, 8 tons	52.86	2,650	20.71	900	58.87	2,678	12.80	373	8
9	Phosphated manure, 8 tons	57.14	2,900	19.64	875	63.54	3,090	15.64	718	9
10	None	42.86	2,300	.....	.....	49.74	2,440	.....	.....	10
	Average unfertilized yield	34.91	1,825	. .	.. ..	45.10	2,253	.....	.....	
	Rotation II: Corn-soybeans-wheat-clover. Block G									
1	None	50.71	2,350	.....	.....	57.45	2,580	.....	.....	1
2	Acid phosphate, 200 lb	60.71	2,575	8.57	142	64.68	2,743	7.64	173	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	61.43	2,500	7.86	— 17	66.54	2,900	9.91	340	3
4	None	55.00	2,600	.....	.....	56.23	2,550	.....	.....	4
5	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.	63.57	3,000	9.17	425	59.84	2,830	5.14	312	5
6	Acid phosphate, 130 lb.; muriate potash, 50 lb.; nitrate soda, 20 lb.	62.50	2,800	8.69	250	59.12	2,758	5.94	273	6
7	None	53.21	2,525	.....	.....	51.66	2,453	.....	.....	7
8	Acid phosphate, 160 lb.; muriate potash, 20 lb.; nitrate soda 20 lb.	58.21	2,450	6.78	.....	59.71	2,718	9.01	294	8
9	Acid phosphate, 160 lb.; muriate potash 20 lb.; nitrate soda, 20 lb. Catch crop	55.36	2,450	5.72	75	55.77	2,706	6.03	311	9
10	None	47.86	2,300	.....	.....	48.79	2,366	.....	.....	10
	Average unfertilized yield	51.70	2,444	.....	.....	53.53	2,487	.....	.....	

TABLE III, Part 2.—Fertilizers and manure on CORN, Miami County Experiment Farm

Plot	Treatment per acre	1915				5-year average				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	
	Rotation III: Corn-corn-oats-clover. Corn first crop. Block L									
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	23.21	1,400	.....	.....	36.96	2,000	.....	.....	1
2	Acid phosphate, 200 lb	37.50	2,100	7.98	442	47.83	2,350	8.69	278	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	50.00	2,275	14.17	358	53.93	2,545	12.61	402	3
4	None	42.14	2,175	.....	.....	43.50	2,215	.....	.....	4
5	Acid phosphate, 200 lb ; muriate potash, 50 lb.; nitrate soda, 50 lb	60.00	2,500	19.53	383	54.72	2,540	12.40	342	5
6	Acid phos., 200 lb.; mur. potash, 50 lb.; nit. soda, 50 lb,; powdered limestone, 4,000 lb	64.29	2,800	25.48	742	55.70	2,450	14.57	269	6
7	None	37.14	2,000	.....	.....	39.94	2,164	.....	.....	7
8	Untreated manure, 8 tons	65.71	2,575	29.28	675	60.23	2,663	18.53	490	8
9	Phosphated manure, 8 tons	63.57	2,700	27.86	900	61.24	2,680	17.79	498	9
10	None	35.00	1,700	.....	.....	45.21	2,190	.....	.....	10
	Average unfertilized yield	34.37	1,819	.....	.....	41.40	2,142	.....	.....	
	Rotation III: Corn-corn-oats-clover. Corn second crop. Block K									
1	None	45.00	2,200	.....	.....	32.41	1,790	.....	.....	1
2	Acid phosphate, 200 lb	52.86	2,200	5.84	—50	46.57	2,206	10.71	328	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb	61.07	2,450	12.02	150	51.26	2,368	11.95	402	3
4	None	51.07	2,350	.....	.....	42.74	2,054	.....	.....	4
5	Acid phosphate, 200 lb.; muriate potash, 20 lb.; nitrate soda, 80 lb	60.71	2,525	13.81	267	52.48	2,475	11.11	417	5
6	Acid phosphate, 200 lb.; muriate potash, 20 lb.; nitrate soda, 80 lb	55.00	2,475	12.26	308	51.70	2,587	11.69	524	6
7	None	38.57	2,075	.....	.....	38.64	2,067	.....	.....	7
8	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb	65.00	2,925	29.76	875	57.10	2,893	18.35	726	8
9	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb	67.86	2,800	35.96	775	57.92	2,954	19.07	686	9
10	None	28.57	2 000	.....	.....	38.96	2,368	.....	.....	10
	Average unfertilized yield	40.80	2 156	.....	.....	38.19	2,070	.....	.....	

TABLE III, Part 3.—Fertilizers and manure on CORN, Miami County Experiment Farm

Rotation V: Corn-wheat-clover

Plot	Treatment per acre	Yield per acre		Increase per acre		Plot
		Grain	Stover	Grain	Stover	
		Bu.	Lb.	Bu.	Lb.	
1	None	46.43	2,175			1
2	Acid phosphate, 200 lb	42.50	2,125	−3.33		2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	53.21	2,450	7.97	375	3
4	None	44.64	2,025			4
5	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb	47.50	2,125	3.22	58	5
6	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.; limestone, 2 tons	47.50	2,150	3.57	42	6
7	None	43.57	2,150			7
8	Untreated manure, 8 tons	58.93	2,500	14.88	300	8
9	Phosphated manure, 8 tons	65.71	2,875	21.19	625	9
10	None	45.00	2,300			10
	Average unfertilized yield	44.91	2 162			

TABLE IV.—Fertilizers and manure on OATS, Miami County Experiment Farm

Plot	Treatment per acre	1915				4-year average				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Rotation I: Corn-oats-wheat-clover. Block A									
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	51.87	3,140	.....	.....	44.18	2,662	.....	.....	1
2	Acid phosphate, 100 lb.	68.91	3,045	14.64	—168	53.93	2,724	7.11	132	2
3	Acid phosphate, 100 lb.; muriate potash, 20 lb	75.00	3,500	18.34	213	59.45	2,816	9.99	294	3
4	None	59.06	3,360	.....	.....	52.11	2,451	.....	.....	4
5	Acid phosphate, 100 lb.; muriate potash, 20 lb.; nitrate soda, 30 lb	69.69	3,420	10.63	—107	57.68	2,462	6.57	8	5
6	Acid phosphate, 100 lb.; muriate potash, 20 lb.; nitrate soda, 30 lb.*	68.75	3,700	9.69	7	59.22	2,705	9.09	249	6
7	None	59.06	3,860	.....	.....	49.14	2,459	.....	.....	7
8	Untreated manure on corn	66.25	4,380	6.36	480	51.95	2,662	7.29	262	8
9	Phosphated manure on corn	67.19	4,300	6.46	360	53.75	2,905	8 96	492	9
10	None	61.56	3,980	.....	.....	44.92	2,425	.....	.....	10
	Average unfertilized yield	58.69	3,585	.....	.....	49.41	2,568	.....	.....	
	Rotation III: Corn-corn-oats-clover. Block I									
1	None	62.36	3,355	.....	.....	46.06	2,326	.....	.....	1
2	Acid phosphate, 100 lb	72.50	3,580	12.18	— 23	55.47	2,544	7.42	— 12	2
3	Acid phosphate, 100 lb.; muriate potash, 20 lb	74.06	3,730	15.77	—122	60.77	3,017	10.74	231	3
4	None	56.25	4,100	.....	.....	52.03	3,016	.....	.....	4
5	Acid phosphate, 100 lb.; muriate potash, 20 lb.; nitrate soda, 30 lb	65.62	3,700	9.89	— 33	59.26	2,922	7.94	94	5
6	Acid phosphate, 100 lb.; muriate potash, 20 lb.; nitrate soda, 30 lb*	60.31	3,520	5.10	153	58.67	2,914	8.07	272	6
7	None	54.69	3,000	.....	.....	49.88	2,454	.....	.....	7
8	Untreated manure on corn	69.37	4,030	11.76	757	56.24	3,212	7.98	750	8
9	Phosphated manure on corn	64.69	4,280	4.17	733	56.56	3,240	8.67	735	9
10	None	63.44	3,820	.....	.....	48.52	2,547	.....	.....	10
	Average unfertilized yield	59.18	3,569	.....	.....	50.26	2,643	.....	.....	

*Powdered limestone on corn.

TABLE V.—Fertilizers on SOYBEANS, Miami County Experiment Farm

Rotation II: Corn-soybeans-wheat-clover. Block F

Plot	Treatment per acre	1915				4-year average				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Straw	Grain	Straw	Grain	Straw*	Grain	Straw*	
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	25.33	1,760			23.71	2,495			1
2	Acid phosphate, 100 lb	26.50	2,410	1.03	518	25.39	2,950	2.21	555	2
3	Acid phosphate, 100 lb Muriate potash, 20 lb	27.58	1,920	1.98	—103	24.37	2,540	1.71	247	3
4	None	25.74	2,155			22.14	2,192			4
5	Acid phosphate, 100 lb Muriate potash, 20 lb Nitrate soda, 30 lb	26.67	2,275	2.15	238	22.94	3,482	1.45	407	5
6	Acid phosphate, 70 lb Muriate potash, 20 lb Nitrate soda, 10 lb	25.00	2,100	1.70	182	20.71	1,955	— .12	— 2	6
7	None	22.08	1,800			20.16	1,840			7
8	Acid phosphate, 100 lb	24.50	2,230	2.70	222	21.85	1,935	1.97	89	8
9	Acid phosphate, 100 lb	23.17	2,135	1.64	— 82	20.65	2,065	1.05	213	9
10	None	21.25	2,425			19.31	1,857			10
	Average unfertilized yield	23.60	2,035			21.33	2 096			

*Average of straw for 1914 and 1915 only.

Fertilizers and manure on oats.—The oat crops show a gain for acid phosphate of more than 7 bushels per acre, which is raised to 10 bushels when muriate of potash is added, but with oats as with corn the further addition of nitrate of soda seems to diminish rather than increase the yield. The residual effect of manuring the corn crop is quite evident in the following oat crop, the average increase being about 7½ bushels per acre for the untreated manure and more than a bushel for the phosphated manure.

Fertilizers and manure on soybeans.—The soybeans show a comparatively small increase from the fertilizers, and apparently are benefited only by phosphorus.

Fertilizers and manure on wheat.—The wheat crops have given a 3-year average unfertilized yield of 13.17 bushels per acre after oats, and of 17.14 bushels after soybeans. These yields have been increased by 10.72 and 8.76 bushels, respectively, by acid phosphate, but the yields from further applications are too irregular to justify definite conclusions as to their benefit. The yields from the different treatments, however, seem to demonstrate the possibility of increasing materially the yield of wheat on this land.

Fertilizers and manure on clover.—Table VII shows the outcome of the clover crops harvested thus far in this experiment, and indicates a substantial increase from phosphorus in every case except in the tobacco rotation in 1915, but no definite gain from further additions of potassium and nitrogen. Manure has increased the yield in every case.

Fertilizers and manure on tobacco.—The tobacco crops show a regular gain for each fertilizing constituent, with a drop when the quantity of fertilizer is reduced. In this experiment the fertilizers are all applied to the tobacco crop and in much larger quantities than those used in the cereal rotations, but at the relatively high acre-value of this crop it has more than paid the entire cost of the fertilizing, leaving the increases from the wheat and clover as clear gain.

TABLE VI.—Fertilizers and manure on WHEAT, Miami County Experiment Farm

Plot	Treatment per acre	1915				3-year average				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Rotation I: Corn-oats-wheat-clover. Block D									
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	3.33	700			15.58	1,807			1
2	Acid phosphate, 200 lb	22.67	2,140	19.59	1,542	25.22	2,578	10.72	910	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb	19.00	1,810	16.17	1,313	23.97	2,445	10.56	914	3
4	None	2.58	395			12.33	1,393			4
5	Acid phosphate, 200 lb.; muriate potash, 20 lb.; nitrate soda, 80 lb	29.00	2,760	24.14	2,018	22.00	2,647	10.82	1,336	5
6	Acid phosphate, 200 lb.; muriate potash, 20 lb.; nitrate soda, 80 lb*	32.50	3,200	25.36	2,112	26.94	2,767	16.92	1,530	6
7	None	9.42	1,435			8.86	1,147			7
8	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.†	31.67	3,700	21.22	2,110	24.31	2,700	13.10	1,276	8
9	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.‡	31.50	3,810	20.03	2,065	25.67	2,910	12.12	1,208	9
10	None	12.50	1,900			15.89	1,980			10
	Average fertilized yield	27.72	2,903			24.68	2,674			
	Average unfertilized yield	6.96	1 107			13.17	1,582			
	Rotation II: Corn-soybeans-wheat-clover. Block E.									
1	None	19.50	2 380			22.22	2,350			1
2	Acid phosphate, 200 lb	31.50	3,185	14.19	1,157	29.42	3,062	8.76	823	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb	28.42	2,845	13.31	1,168	29.47	3,232	10.38	1,105	3
4	None	12.92	1,325			17.53	2,015			4
5	Acid phosphate, 200 lb.; muriate potash, 20 lb.; nitrate soda, 80 lb	27.33	2,935	15.27	1,633	30.55	2,528	13.74	1,546	5
6	Acid phosphate, 160 lb.; muriate potash, 20 lb.; nitrate soda, 30 lb	22.17	2,370	10.98	1,092	27.72	3 160	11.62	1,209	6
7	None	10.33	1,255			15.39	1,918			7
8	Acid phosphate, 170 lb.; nitrate soda, 30 lb	22.17	2,095	12.45	905	26.44	2,882	11.71	1,085	8
9	Acid phosphate, 170 lb.; nitrate soda, 30 lb.§	22.83	2,330	13.72	1,205	26.26	2,553	12.19	880	9
10	None	8.50	1,060			13.42	1 552			10
	Average fertilized yield	25.74	2,627			28.31	3,069			
	Average unfertilized yield	12.81	1 505			17.14	1 959			

*Fertilizers and limestone on corn. †Untreated manure on corn. ‡Phosphated manure on corn. §Catch crop to follow corn.

TABLE VI.—Fertilizers and manure on WHEAT, Miami County Experiment Farm—Concluded

Rotation IV: Tobacco-wheat-clover. Block P

Plot	Treatment per acre, all on tobacco	1915				3-year average				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	7.67	1,340	.....	.....	25.97	2,806	.....	.....	1
2	Acid phosphate, 480 lb	15.67	1'710	9.22	513	30.61	2'295	3.67	—405	2
3	Acid phosphate, 480 lb. Muriate potash, 180 lb.	16.50	1,460	11.28	407	32.86	3,038	4.96	445	3
4	None	4.00	910	.....	.....	28.86	2 487	.....	.....	4
5	Acid phosphate, 480 lb. Muriate potash, 180 lb. Nitrate soda, 240 lb.	17.17	1,770	13.23	973	34.17	3 212	7.02	815	5
6	Acid phosphate, 480 lb. Muriate potash, 180 lb. Nitrate soda, 240 lb. Ground limestone, 2,000 lb.	19.50	2 080	15.61	1 397	34.94	2,917	9.51	610	6
7	None	3.83	570	.....	.....	23.72	2 217	.....	.....	7
8	Acid phosphate, 240 lb. Muriate potash, 90 lb. Nitrate soda, 120 lb	6.83	840	—.33	—247	25.72	1 812	2.00	—365	8
9	Acid phosphate, 400 lb. Stable manure, 10 tons	18.17	1 910	7.67	307	29.61	2,680	5.89	533	9
10	None	13.83	2 120	.....	.....	23.72	2,097	.....	.....	10
	Average unfertilized yield	7.33	1 235	.....	.....	25.57	2 402	.....	.....	

TABLE VII.—Resid effect on CLOVER of fertilizers and manure applied to previous crops, Miami County Experiment Farm

Plot	Treatement per acre Total fertilizers and manure on previous crops of the rotation	Yield per acre		Increase per acre		Plot
		1915	2-year average	1915	2-year average	
	Rotation I: Corn-oats-wheat-clover. Block C					
		Lb.	Lb.	Lb.	Lb.	
1	None	4,758	3,677			1
2	Acid phosphate, 500 lb.	4,926	3,694	596	394	2
3	Acid phosphate, 500 lb.; muriate potash, 90 lb.	4,905	3,328	1,003	405	3
4	None	3,474	2,546			4
5	Acid phosphate, 500 lb.; muriate potash, 90 lb.; nitrate soda, 160 lb.	4,842	3,274	1,277	794	5
6	Acid phosphate, 500 lb.; muriate potash, 90 lb.; nitrate soda, 160 lb.; ground limestone, 2 tons.	5,032	3,391	1,376	977	6
7	None	3,747	2,349			7
8	Acid phosphate, 200 lb.; untreated manure, 8 tons	4,442	2,874	786	415	8
9	Acid phosphate, 200 lb.; phosphated manure, 8 tons	4,926	3,561	1,361	992	9
10	None	3,474	2,679			10
	Average unfertilized yield	3,863	2,812			
	Rotation II: Corn-soybeans-wheat-clover. Block H					
1	None	4,716	3,371			1
2	Acid phosphate, 500 lb.	5,284	4,228	673	829	2
3	Acid phosphate, 500 lb.; muriate potash, 90 lb.	5,221	4,241	716	815	3
4	None	4,400	3,453			4
5	Acid phosphate, 500 lb.; muriate potash, 90 lb.; nitrate soda, 160 lb.	4,758	3,765	365	271	5
6	Acid phosphate, 360 lb.; muriate potash, 90 lb.; nitrate soda, 50 lb.	4,484	3,651	98	116	6
7	None	4,379	3,576			7
8	Acid phosphate, 430 lb.; muriate potash, 20 lb.; nitrate soda, 50 lb.	4,400	3,831	115	324	8
9	Acid phosphate, 430 lb.; muriate potash, 20 lb., nitrate soda, 50 lb. Catch crop	4,758	3,965	567	528	9
10	None	4,097	3,368			10
	Average unfertilized yield	4,398	3,442			

TABLE VII.—Residual effect on CLOVER of fertilizers and manure applied to previous crops, Miami County Experiment Farm —Continued

Plot	Treatment per acre Total fertilizers and manure on previous crops of the rotation	Yield per acre		Increase per acre		Plot
		1915	2-year average	1915	2-year average	
	Rotation III: Corn—corn—oats—clover. Block M					
		Lb.	Lb.	Lb.	Lb.	
1	None	1,305	1,319			1
2	Acid phosphate, 500 lb	2,674	2,137	1,158	623	2
3	Acid phosphate, 500 lb.; muriate potash, 90 lb	2,779	2,211	1,053	504	3
4	None	1,937	1,902			4
5	Acid phosphate, 500 lb.; muriate potash, 90 lb.; nitrate soda, 160 lb	2,905	2,408	659	425	5
6	Acid phosphate, 500 lb.; muriate potash, 90 lb.; nitrate soda, 160 lb.; limestone, 2 tons	3,453	3,024	899	962	6
7	None	2,863	2,142			7
8	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.; manure, 8 tons	3,789	3,028	596	756	8
9	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.; phosphated manure, 8 tons	4,126	3,352	603	950	9
10	None	3,853	2,531			10
	Average unfertilized yield	2,489	1,973			

TABLE VII.—Residual effect on CLOVER of fertilizers and manure applied to previous crops, Miami County Experiment Farm—Concluded

Plot	Treatment per acre Total fertilizers and manure on previous crops of the rotation	Yield per acre		Increase per acre		Plot
		1915	2-year average	1915	2-year average	
	Rotation IV: Tobacco-wheat-clover. Block O					
		Lb.	Lb.	Lb.	Lb.	
1	None	7,411	5,839			1
2	Acid phosphate, 480 lb.	6,821	8,337	—407	2,368	2
3	Acid phosphate, 480 lb. Muriate potash, 180 lb.	7,158	8,266	112	2,165	3
4	None	6,863	6,231			4
5	Acid phosphate, 480 lb. Muriate potash, 180 lb. Nitrate soda, 240 lb.	7,116	7,540	85	1,165	5
6	Acid phosphate, 480 lb. Muriate potash, 180 lb. Nitrate soda, 240 lb. Ground limestone, 2,000 lb.	6,779	7,443	—421	924	6
7	None	7,368	6,662			7
8	Acid phosphate, 240 lb. Muriate potash, 90 lb. Nitrate soda, 120 lb.	6,863	6,784	—337	354	8
9	Acid phosphate, 400 lb. Stable manure, 10 tons.	7,158	7,201	127	1,004	9
10	None	6,863	5,965			10
	Average unfertilized yield	7,126	6,174			

TABLE VIII.—Fertilizers and manure on TOBACCO, Miami County Experiment Farm

Rotation IV: Tobacco-wheat-clover. Block N

Plot	Treatment per acre	1915		4-year average		Plot
		Yield per acre	Increase per acre	Yield per acre	Increase per acre	
		Lb.	Lb.	Lb.	Lb.	
1	None	1,070		1,305		1
2	Acid phosphate, 480 lb	1,300	187	1,556	235	2
3	Acid phosphate, 480 lb.; muriate potash, 180 lb	1,360	203	1,642	306	3
4	None	1,200		1,352		4
5	Acid phosphate, 480 lb.; muriate potash, 180 lb.; nitrate soda, 240 lb	1,580	480	1,630	368	5
6	Acid phosphate, 480 lb.; muriate potash, 180 lb.; nitrate soda, 240 lb.; ground limestone, 2,000 lb.	1,180	180	1,594	422	6
7	None	900		1,081		7
8	Acid phosphate, 240 lb.; muriate potash, 90 lb.; nitrate soda, 120 lb	910	30	1,310	265	8
9	Acid phosphate, 400 lb.; stable manure, 10 tons	905	45	1,272	263	9
10	None	840		972		10
	Average unfertilized yield	1,002		1,177		

TABLE IX.—Fertilizers and manure on crops grown in rotation, Miami County Experiment Farm. Average value of increase, cost of fertilizers and net gain per acre for one rotation

Plot	Treatment per acre Total fertilizers and manure for one 4-year rotation	Average increase per acre							Total value of increase	Total cost of fertilizer	Net gain	Plot
		Corn		Oats or soybeans		Wheat		Clover				
		Grain	Stover	Grain	Straw	Grain	Straw					
	Rotation I: Corn-oats-wheat-clover											
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Lb.	Dollars	Dollars	Dollars	
1	None											1
2	Acid phosphate, 500 lb	11.00	232	7.11	132	10.72	910	394	18.07	3.50	14.57	2
3	Acid phosphate, 500 lb.; muriate potash, 90 lb	12.35	470	9.99	294	10.56	914	405	19.92	5.75	14.17	3
4	None											4
5	Acid phosphate, 500 lb.; muriate potash, 90 lb.; nitrate soda, 160 lb	10.29	369	6.57	8	10.82	1,336	794	19.82	10.55	9.27	5
6	Acid phos., 500 lb.; mur. pot., 90 lb.; nit. soda, 160 lb.; ground limestone, 2 tons	9.70	410	9.09	249	16.92	1,538	977	26.46	16.55	9.91	6
7	None											7
8	Acid phosphate, 200 lb.; untreated manure, 8 tons	12.80	373	7.29	262	13.10	1,276	415	21.54	8.15	13.39	8
9	Acid phosphate, 200 lb.; phosphated manure, 8 tons	15.64	718	8.96	492	12.12	1,208	992	25.38	10.40	14.98	9
10	None											10
	Rotation II: Corn-soybeans-wheat-clover											
1	None											1
2	Acid phosphate, 500 lb	7.64	173	2.21	*555	8.76	823	829	17.23	3.50	13.73	2
3	Acid phosphate, 500 lb.; muriate potash, 90 lb	9 91	340	1.71	247	10.38	1,105	815	19.10	5.75	13.35	3
4	None											4
5	Acid phosphate, 500 lb.; muriate potash, 90 lb.; nitrate soda, 160 lb	5.14	312	1.45	407	13.74	1,546	271	18.00	10.55	7.45	5
6	Acid phosphate, 360 lb.; muriate potash, 90 lb.; nitrate soda, 50 lb	5.94	273	.12	— 2	11.62	1,209	116	13.63	6.27	7.36	6
7	None											7
8	Acid phosphate, 430 lb.; muriate potash, 20 lb.; nitrate soda, 50 lb	9.01	294	1.97	89	11.71	1,085	324	17.85	5.00	12.85	8
9	Acid phos., 430 lb.; mur. potash, 20 lb.; nitrate soda, 50 lb. Catch crop	6.03	311	1.05	213	12.19	880	528	16.88	10.00	6.88	9
10	None											10

*Soybean straw average for 1914 and 1915 only.

TABLE IX.—Fertilizers and manure on crops grown in rotation, Miami County Experiment Farm. Average value of increase, cost of fertilizers and net gain per acre for one rotation—Concluded

Plot	Treatment per acre Total fertilizers and manure for one 4-year rotation	Average increase per acre							Total value of increase	Cost of fertilizer	Net gain	Plot
		Corn, 1st year		Corn, 2d year		Oats		Clover				
		Grain	Stover	Grain	Stover	Grain	Straw					
	Rotation III: Corn-corn-oats-clover											
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Lb.	Dollars	Dollars	Dollars	
1	None											1
2	Acid phosphate, 500 lb	8.69	278	10.71	328	7.42	−12	623	17.08	3.50	13.58	2
3	Acid phosphate, 500 lb.; muriate potash, 90 lb	12 61	402	11.95	402	10 74	231	504	21.87	5.75	16.12	3
4	None											4
5	Acid phosphate, 500 lb.; muriate potash, 90 lb.; nitrate soda, 160 lb	12.40	342	11.11	417	7.94	94	425	18.69	10.55	8.14	5
6	Acid phos., 500 lb.; mur. potash, 90 lb.; nit. soda, 160 lb.; limestone, 2 tons	14.57	269	11.69	524	8.07	272	962	22.27	16.55	5.72	6
7	None											7
8	Acid phos., 200 lb.; mur. potash, 50 lb.; nit. soda, 50 lb.; manure, 8 tons	18.53	490	18.35	726	7.98	750	756	26.73	8.15	18 58	8
9	Acid phos., 200 lb.; mur. potash, 50 lb.; nit. soda, 50 lb.; phos. manure, 8 tons	17.79	498	19.07	686	8.67	735	950	27.99	10.39	17.60	9
10	None											10

Plot	Treatment per acre Total fertilizers and manure for one 3-year rotation	Tobacco	Wheat		Clover	Total value of increase	Cost of fertilizer	Net gain	Plot
			Grain	Straw					
	Rotation IV: Tobacco-wheat-clover								
		Lb.	Bu.	Lb.	Lb.	Dollars	Dollars	Dollars	
1	None								1
2	Acid phosphate, 480 lb	235	3.67	−405	2,368	30.80	3.36	27.44	2
3	Acid phosphate, 480 lb.; muriate potash, 180 lb	306	4.96	445	2,165	37.55	7.86	29.69	3
4	None								4
5	Acid phosphate, 480 lb.; muriate potash, 180 lb.; nitrate soda, 240 lb	368	7.02	815	1,165	40.57	15.06	25.51	5
6	Acid phos., 480 lb.; mur. potash, 180 lb.; nit. soda, 240 lb.; ground limestone, 2,000 lb	422	9.51	610	924	45.67	18 06	27.61	9
7	None								7
8	Acid phosphate, 240 lb.; muriate potash, 90 lb.; nitrate soda, 120 lb	265	2.00	−365	354	23.85	7.53	16.32	8
9	Acid phosphate, 400 lb.; stable manure, 10 tons	263	5.89	543	1,004	30.31	7.80	22.51	9
10	None								10

The prices used in computing values in this bulletin are as follows: Corn, 40 cents a bushel; oats, 30 cents; wheat, 80 cents; soybeans, $1; stover, $3 a ton; wheat, oat and soybean straw, $2; hay, $8; tobacco, 8 cents a pound; sugarbeets, $4½ a ton; manure, 50 cents a ton; powdered limestone, $3; sugar factory lime, $1.50; acid phosphate, $14; floats, $10; muriate of potash, 2½ cents a pound; nitrate of soda, 3 cents; 2-8-2 fertilizer, $21.60 a ton; steamed bonemeal, $28.80; catch crop, $5 per acre. The price for farm crops is assumed to be their average value on the farm and those for lime, fertilizers and manure their cost spread on the land.

Effect of lime.—Plots 5 and 6 in Rotations I, III, IV and V receive the same treatment except that the corn crops receive an additional dressing on Plot 6 of 2 tons of ground limestone, and the tobacco crop of 1 ton. The outcome of this treatment has been an apparent increase for the liming of an average of 0.70 bushel of corn per acre in 16 comparisons (5 in Rotation I, 10 in Rotation III, and 1 in Rotation V), 1.33 bushel of oats in 8 comparisons, 3.52 bushels of wheat in 7 comparisons and 160 pounds of hay in 6 comparisons. Such a rate of increase from the four crops following each other in succession would practically cover the cost of the liming, but the relatively high increase in the wheat crop, which usually shows less need of lime than corn, leads to a doubt whether the increase in that crop may not be chiefly due to soil variation rather than to the liming.

The considerable variation in the soil on which this experiment is located will make it necessary to continue the work through at least two complete rotations before definite conclusions will be warranted.

The financial outcome.—Table IX shows the increase in each crop due to the treatment, the cost of treatment, and the value of increase for each rotation. In every case the cost of acid phosphate has been recovered several times over in the increase of crop, and in the general average the additional cost of the muriate of potash has been recovered with some profit, although there has been a slight loss in two of the rotations; but in no case has the cost of nitrogen, as given in nitrate of soda, been recovered in the increase produced by its addition to the fertilizer.

The addition of ground limestone to the complete fertilizer appears to have increased the yield, but it is doubtful as yet whether the increase has paid the additional cost of the treatment.

Stable manure has produced a regular increase, and when reinforced with acid phosphate the effect has been greater.

In general, it appears that this soil is markedly deficient in phosphorus, and that when this deficiency is supplied clover grown in short rotations will furnish all the nitrogen required, and temporarily at least, most of the potassium. That is, the clover roots will have brought into available condition a considerable amount of the crude potassium of the soil, and any further deficiency can be made up by small applications of manure.

For a hundred years there has flowed down the Miami Valley a stream of phosphorus, invisible it is true, but no less real than the stream of water flowing between the river banks; a stream carried

in the great crops of wheat and corn, which have gone down the valley in the pioneer's wagon, in canal boats and railway cars, or in the bones of the hogs and cattle which were first driven and later hauled to the great market at the end of the valley. Every carload of grain has carried from 100 to 200 pounds of phosphorus, and every carload of hogs or cattle from 75 to 150 pounds; but an acre of Miami County soil may contain only 1,600 pounds of phosphorus in the upper 7 inches. Hence it is only a question of time when restitution must be made if profitable crop production is to be continued.

Fig. 1.—Results of complete fertilizer on wheat, Miami County Experiment Farm.

It is true that a 25-acre field of Miami County land contains sufficient phosphorus in the upper 7 inches to furnish a 1,000-bushel carload of corn, which is Miami County's present rate of production, every year for 300 years, but nature guards against man's extravagance by reducing the rate of yield long before the point of exhaustion is reached; hence we see the response of this soil to fertilizers containing phosphorus.

Miami County grows annually more than 90,000 acres of wheat and corn. If 200 pounds of acid phosphate per acre, spread over these 90,000 acres, should produce half the effect on the average Miami County soil that it is doing on the county experiment farm, it would bring to the farmers of that county each year $100,000 more than its cost, at the usual price of acid phosphate, and three-fourths of that amount at present prices.

Fig. 2.—Residence of farm foreman, Miami County Experiment Farm.

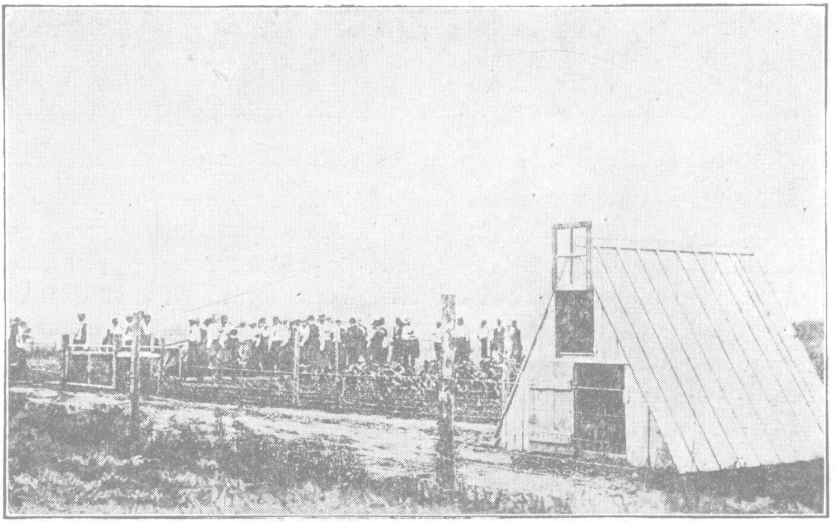


Fig. 3.—Viewing the "hog work" on Field Day, Miami County Experiment Farm.

Record of cropping—1915

Area of farm, 123 acres
Acres cultivated, not surveyed
Permanent pasture, not surveyed
Woodland, 1 acre
Waste, none
Roads (farm), not surveyed
Roads (public), not surveyed
Miscellaneous, 2 acres

PLOT WORK	Number of plots	Total acreage	Total yield	Yield per acre
Corn	65	6.35	22890.00 lb.	51.43 bu.
Oats	32	3.10	6409.10 "	64.61 "
Barley	1	.10	155.50 "	32.40 "
Emmer	1	.10	88.50 "	27.65 "
Wheat	66	5.15	7839.00 "	25.37 "
Soybeans	21	2.10	2991.50 "	23.74 "
Cowpeas	1	.10	19.00 "	3.166 "
Tobacco	27	1.00	1237.75 "	1237.75 "
Hay	62	6.175	31884.00 "	2.58 T
Potatoes	10	.43	Damaged by water, not dug	
Alfalfa	12	1.20	Not cut	
Total	298	25.80		
FIELD WORK				
Corn		7.25	25425.00 lb.	50.10 bu.
Corn (hogged off)		9.00	*29064.00 "	46.13 "
Oats		6.33	9700.16 "	47.89 "
Wheat		8.16	12403.20 "	25.33 "
Hay—clover and timothy		10.00	56000.00 "	2.80 T
Rye		3.00	†2184.00 "	13.00 bu.
Soybeans		7.99	8043.66 "	17.78 "
Clover hay (hogged off)		3.00		
Alfalfa { Hog work		1.00	Hogged off	
Alfalfa { Orchard		.44	Plowed down	
Orchard		2.06(esti.)		
Rape		1.00	Hogged off	
Total		59.23		

	Corn	Oats	Wheat	Soybeans
Lowest-yielding plots per acre ....bushels..	23.21	27.66	....	18.42
Highest-yielding plots per acre....do....	71.78	91.00	43.5	27.58

Number crop acres:
Field work....59.23
Plot work....25.80
Total....85.03

Number work horses used in 1915.... 5
Number crop acres per work horse.... 17
Number man hours per year (from Mar. 1, 1915 to Feb. 29, 1916 inclusive).... 9209.25
Number horse hours per year (from Mar. 1, 1915 to Feb. 29, 1916 inclusive).... 5566.25
(Two extra horses were hired for a short time during the summer)

*Estimated from two rows husked and weighed from each field.
†Estimated from 1 acre cut

VARIETY COMPARISONS

DEPARTMENT OF AGRONOMY

Corn.—Ten varieties of corn were tested in 1915. Of this number 3-year records are available for eight varieties and 4-year records for four varieties. In the 4-year average the Darke County Mammoth stands first and Cook's 75, second. In the 3-year average Boone County White is first; Darke County Mammoth, second;

and Clarage, third. The yield of stover is highest with the Boone County White and lowest with the Clarage. The Boone County White is rather large and late for this section.

TABLE X.—Comparison of varieties of CORN, Miami County Experiment Farm

Variety	Yield of grain per acre (bushels)						3-year average yield of stover (pounds)
	1915	1914	1913	1912	4-year average	3-year average	
Leaming	59.37	63.31	48.61	49.80	55.27	57.10	2,433
Clarage	57.53	63.12	59.91	.....	.....	60.52	2,150
White Cap	59.13	58.21	55.86	.....	.....	57.73	2,483
Cook's 75	58.89	64.40	57.29	64.03	61.15	60.19	2,817
Reid (Orcutt)	55.56	62.93	59.84	.....	.....	59.44	2,800
Ohio 84 (Early Reid)	52.35	61.09	47.60	44 74	51.44	53.68	2,342
Boone County White*	71.76	67.95	.....	59.97	.....	66.56	3,342
Leaming—Cuppy	.....	61 16	48.53	.....	.....	.....	.....
Darke County Mammoth	61.87	65.55	58.39	65.22	62.76	61.94	2,902
Booher	53.37	.....	.....	.....	.....	.....	.....
Mortgage Lifter	63.72	.....	.....	.....	.....	.....	.....

*Less mature.

Oats.—The variety oats test includes seven varieties which have been tested continuously for 4 years, with the exception that the pure line strain of the Improved American tested in 1912 gave place to a strain of the same variety. As a 4-year average the Big Four is first in yield, with the Improved American selection (Ohio 6222) second, and Ohio 6203, a Siberian selection, third.

The Oderbrucker barley has given a 4-year average yield of 31.94 bushels per acre, and emmer, 39.85 bushels. The barley is figured at 48 pounds per bushel and emmer at 32 pounds.

TABLE XI.—Comparison of varieties of OATS, Miami County Experiment Farm

Variety	Yield of grain per acre (bushels)					4-year average yield of straw per acre (pounds)
	1915	1914	1913	1912	4-year average	
Big Four	69.03	48.60	62.99	78.17	64.70	2,622
Silvermine	58.78	44.38	61.07	77.76	60.50	2,471
Swedish Select	56.27	42.29	61.12	78.59	59.57	2,650
Ohio 7009 (Sixty Day)	64.76	48.75	44.14	74.21	57.96	1,746
Ohio 6203 (Siberian)	66.85	45.63	60.75	75.15	62.09	2,953
Ohio 6222 (Improved American)	67.78	54.38	51.85	.....	63.18	2,746
Ohio 6143 (Improved American)	.....	.....	.....	78.70		
Wideawake	61.79	47.19	57.11	71.40	59.37	2,744
Oderbrucker barley	32.40	22.21	36.03	32.08	31.94	1,933
Emmer	26.12	35.78	61.56	35.94	39.85	2,300

Wheat.—The variety wheat test covers a period of 3 years and includes 14 varieties for the full period. Varieties of wheat are grown in two rotations, but by means of the common check it is possible to compare the yields of these different rotations with each

other. As a result of such comparisons the Portage wheat is first in yield; the Goens, second; Valley, third; Trumbull, fourth; and the Gladden, fifth. The average yield of the three highest-yielding varieties is 5.6 bushels per acre more than the three lowest.

TABLE XII.—Comparison of varieties of WHEAT, Miami County Experiment Farm

Variety	Yield of grain per acre (bushels)				3-year average yield of straw per acre (pounds)
	1915	1914	1913	3-year average	
Fultz	35.73	31.27	35.55	34.18	4,173
Trumbull (5309)	38.90	37.32	41.44	39.22	4,303
Ohio 8106 (Fultz)	33.72	34.15	36.83	34.90	4,256
Poole	33.57	34.99	38.50	35.69	4,475
Portage (6400)	39.90	35.11	49.44	41.48	4,147
Gypsy	38.12	35 37	39.32	37.60	4,263
Gladden (6100)	36.16	35.42	43.85	38.48	4,677
Mediterranean	33.49	32 92	38.47	34.96	4,578
Rudy	35.26	33.76	43.22	37.41	3,858
Turkey Red	30.53	37.48	38.58	35.53	4,508
Valley	35 48	41.29	49.10	39.62	4,797
Goens	38 56	42.76	3..94	39.75	4,680
Nigger	34.32	36.54	42.94	37.93	4,502
Velvet Chaff	33.90	37.71	36.77	36.13	4,320

Early and late seeding of wheat.—In 1914-1915 a test was conducted in which plots of wheat were drilled under uniform conditions at intervals of one week, beginning September 15 and ending October 27. It will be noted that the seeding made September 22 gave the highest yield, with September 29 second, and October 6 third. The seedings made October 20 and 27 were of little account.

TABLE XIII.—Early and late seeding of wheat

Date of seeding (1914)	Yield per acre
	Bushels
September 15	23.33
September 22	30.00
September 29	26.67
October 6	24.67
October 13	11.33
October 20	2.33
October 27	2.00

Soybeans.—Eight varieties of soybeans and one of cowpeas have been tested over 3 consecutive seasons. As a 3-year average, a yellow variety of soybeans known as Ohio 7496 is highest in yield, with a brown variety, Ohio 9035, second and the Chestnut third. The yield of the New Era cowpeas has ranged from 3 to 9 bushels, with an average of 7.07 bushels per acre, or not quite one-third what the better varieties of soybeans are yielding. The soybeans range from one ton of straw per acre to nearly two tons.

TABLE XIV.—Comparison of varieties of SOYBEANS, Miami County Experiment Farm

Variety	Yield of grain per acre (bushels)				3-year average yield of straw per acre (pounds)
	1915	1914	1913	3-year average	
Ohio 9100	16.75	22.30	12.81	17.19	2,700
Mongol	22.33	27.66	15.29	21.83	2,700
Chestnut	23.61	26.25	16.93	22.26	2,040
Ohio 9035	23.08	27.64	16.67	22.46	2,745
Ebony	20.05	19.66	15.62	18.44	2,340
Ohio 7496	25.07	26.56	20.26	23.96	2,855
Ohio 9016	24.33	23.61	17.12	21.69	2,515
Medium Green	23.83	23.00	15.81	20.88	2,295
New Era cowpeas	3.17	9.37	8.67	7.07	2,346

SWINE HUSBANDRY

DEPARTMENT OF ANIMAL HUSBANDRY

In 1915 a plan similar to that which was followed during 1914 was carried out. With the exception of one-third of the rye, the crops grown on the five 3-acre plots were hogged down. These consisted of the crops in the 4-year rotation of corn, corn, rye and clover, and of the corn on the plot devoted to continuous corn culture. One acre of the nineteen set aside for swine work was seeded to alfalfa during the year. The bluegrass was utilized as pasture for the breeding herd.

Hogging down rye.—On July 21, 28 pigs which averaged 51.8 pounds in weight were turned on 2 acres of the rye and allowed to harvest it. During the 38 days on rye the pigs were fed one-fourth of a pound of tankage daily per head. Following is a brief statement of the results secured:

Initial weight, July 21	pounds..	1,452.0
Final weight, August 28	do....	1,911.5
Total gain	do....	459.5
Average daily gain per pig	do....	.432
Rye required per 100 lb. increase in live weight	do....	360.4
Tankage consumed per 100 lb. increase in live weight	do....	57.127
Net return per acre with hogs at 8 cents		$15.10
Net return per bushel		$ 1.16

The yield of the acre of rye that was cut and threshed was 13 bushels. On this basis the 2 acres that were hogged down were estimated to have yielded 26 bushels of grain.

The 3-acre plot of clover was utilized as pasture for the brood sows and young pigs, and for the older pigs at various times during the summer. Weights were not always taken at the time the hogs were turned on and off this plot and for this reason no definite report can be given as to the value of the clover.

Hogging down corn.—Three 3-acre plots of corn were hogged down during the fall. The results secured are shown in the following summary:

	Plot II Sept. 22 to Oct. 14	Plot III Oct. 14 to Nov. 1	Plot IV Nov. 8 to Nov. 26
Number of pigs	57	62	60
Number of pig days	1,254	1,115	1,080
Initial weight ....pounds..	5,253.5	7,493.0	9,200.0
Final weight ....do....	7,160.	9,246.5	10,990.5
Total gain ....do....	1,906.5	1,753.5	1,790.5
Average daily gain ....do....	1.52	1.57	1.66
Total tankage consumed ....do....	313.5	278.75	270.
Tankage consumed per acre..do....	104.5	92.91	90.
Value of tankage per acre....	$2.61	$2.32	$2.25
Pork produced per acre....pounds..	635.5	584.5	596.8
Estimated yield of corn per acre, 15.5 percent moisture basis..bushels..	39.9	49.7	48.8
Net return (hogs at 8c):			
Per acre	$48.23	$44.44	$45.49
Per bushel	1.21	.94	.93

In each case the pigs were fed tankage in addition to the corn. In order to secure a basis for estimating the yield of corn per acre, the eighth row of each plot (during the time the pigs were on the plot) was harvested and weighed and the moisture content determined. The yield was then estimated upon a moisture basis of 15.5 percent. The corn harvested was fed back each time just before the pigs were taken off the plot.

On November 2 the pigs were vaccinated by the simultaneous method for the prevention of hog cholera. This caused a week's time to elapse after the pigs were taken off the second plot and before they were put on the third plot of corn.

A brief summary for the total of the three plots is given below:

Average daily gain per pig....pounds..	1.58
Average amount of corn consumed per pig....do....	412.8
Amount of pork produced per acre....do....	605.5
Amount of pork produced per bushel of corn....do....	13.2
Gross returns per bushel of corn....	$ .924
Less cost of tankage fed in producing 13.2 lb. pork....	$ .052
Net returns per bushel of corn....	$ .872

In figuring the values of the crops hogged down no items of expense were considered except that the cost of the tankage was deducted, so that in the statements above the standing crops are credited with all the profit.

THE PAULDING COUNTY EXPERIMENT FARM

FIFTH ANNUAL REPORT, FOR THE YEAR 1915

F. M. LUTTS, SUPERINTENDENT
H. A. RAY, FARM FOREMAN

THE WORK OF THE YEAR

DEPARTMENT OF FARM MANAGEMENT

PERSONNEL

On the first of February, 1916, C. Ellis Bundy, county agricultural agent for Paulding County, was transferred by the College of Agriculture of the Ohio State University to work in cow testing, and the Paulding County Experiment Farm has since been under the direct management of the Experiment Station.

FARM IMPROVEMENTS

Farm residence.—When the farm was purchased there was no house on it, the former dwelling having been destroyed by fire. A four-room cottage was built the first season, and a seven-room residence is now under construction, it being necessary to provide houses for two families in order to secure the labor necessary for the work of the farm.

Tile drainage.—Nine hundred and fifty rods of tile have been laid during the year. The cost of this work has been as follows:

6,610 ft. 4 in.-tile at $13 per M	$ 85.93
7,500 ft. 4 in.-tile at $12.50 per M	93.75
715 ft. 6 in.-tile at $22 per M	15.73
6 ft. 7 in.-tile at $30 per M	.18
Hauling from Paulding (2¼ miles), man and team, 40 hours at 40c per hour	16.00
Hauling from Latty (3 miles), man and team, 44 hours at 40c per hour	17.60
Digging 805 rods of trench 30 in. deep with machine at 17c per rod	136.85
Digging 150 rods of trench 24 in. deep with machine at 14c per rod	21.00
Laying 955 rods of tile, covering to make solid, removing stone, digging trenches at ends of field, covering all tile at ends, waiting on breaks in machine, 260 hours at 20c per hour	52.00
Covering 955 rods of tile, 2 men and 2 teams, 12 hours at 80c per hour	9.60
Coal for ditching machine, 7,200 lb. at $3.75 per ton	13.50
Hauling coal 2½ miles, man and team, 6 hours at 40c per hour	2.40
Clearing up after ditching machine, 2 men, 1 team, 3 hours at 60c per hour	1.80
Boarding machine men, 21 meals at 25c per meal	5.25
Total	$471.59
Cost per rod	49.38c

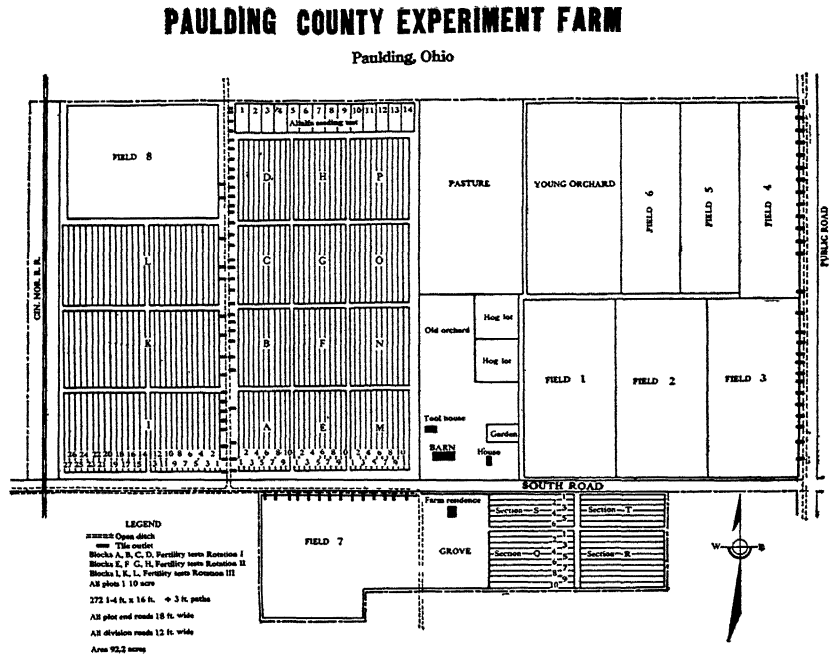


Diagram III.—Plan of Paulding County Experiment Farm

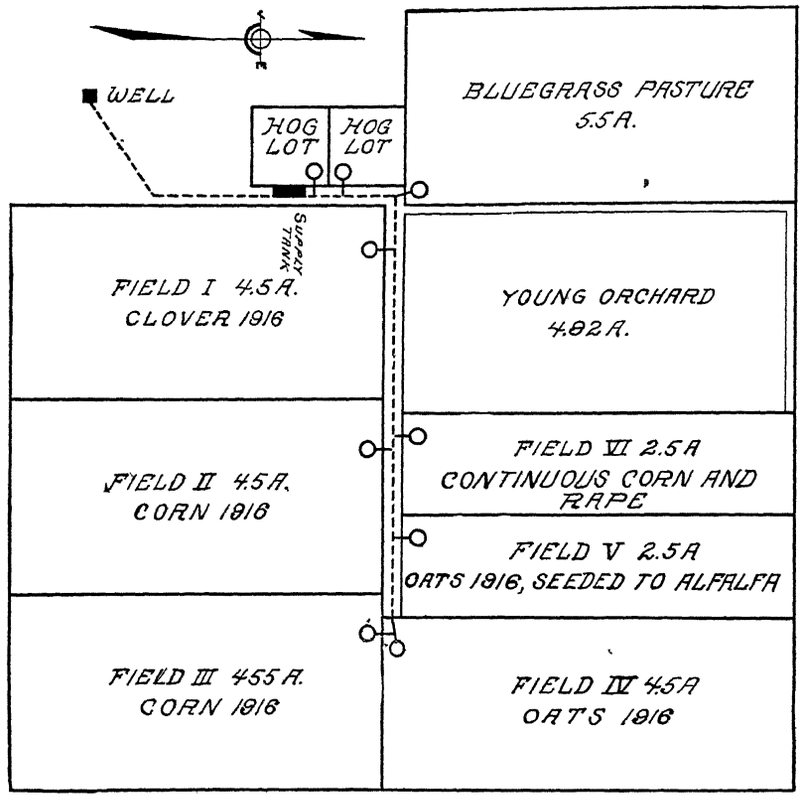


Diagram IV.—Lots for hog-feeding experiments, Paulding County Experiment Farm
Broken line—water pipe. Circles—automatic fountains

Equipment for hog-feeding experiments.—The great increase in cost of labor makes it important to devise methods for the saving of labor in the production and harvesting of crops. For this reason an equipment has been installed at this farm for the investigation of the method of "hogging down" crops, as it is termed, that is, of producing crops upon which hogs are turned at the proper time and allowed to feed at will—a method which has long been practiced in Ohio but concerning the actual economy of which we have little accurate knowledge. In order to obtain more definite information concerning this method six fields (of 2.4 to 4.5 acres each) have been inclosed with wire fence; a watering system has been installed by which water is carried to each field; and a number of movable hog cotes have been constructed for sheltering sows and pigs, and shades for the pigs while in the fields.

The fields will be cultivated in a systematic rotation of crops calculated both to furnish suitable feed for the hogs throughout the season and also to conserve the fertility of the land.

The cost of this equipment has been as follows:

1 portable corn crib, 3½ x 10 x 7 feet in size	$ 16.67
3 "A" hog cotes, 8 x 8 feet in size	40.92
2 "A" hog cotes, 6 x 7 feet in size	20.00
2 hog cote floors, 8 x 8 feet	9.12
1 hay feeder	6.65
1 hog shade, 12 x 15 feet	13.68
Hog troughs	3.00
357 rods wire fence	313.19
Water supply, including well, gasoline engine, tank, 1,348 feet pipe and fittings	303.79
Total	$727.02

This estimate includes labor cost of hauling material and construction.

Orchard work.—An orchard was planted in the spring of 1912, containing 20 varieties of apples and 96 trees set for cultural experiments.

THE MAINTENANCE OF SOIL FERTILITY

DEPARTMENT OF SOILS

Four rotations are being conducted on the Paulding County Experiment Farm, namely:

Rotation I: Corn, oats, wheat, clover.
Rotation II: Corn, soybeans, wheat, clover.
Rotation III: Sugarbeets, oats, clover.
Rotation IV: Corn, oats. (Begun in 1915.)

Rotations I and II are duplicates in treatment of the similar rotations in Miami County, and were begun in 1912, as was also Rotation III. The plan of fertilizing in Rotations I and II is shown

in Table XV, and those of Rotations III and IV in Tables XVII and XIX. The arrangement of plots in Rotations I, II and III is shown in Diagram V, and the outcome of the first four years' work is shown in the tables which follow.

TABLE XV.—Plan of fertilizing, Paulding County Experiment Farm

Pounds of fertilizing materials per acre for each crop

Plot	Acid phosphate	Muriate potash	Nitrate soda	Additional treatment	Acid phosphate	Muriate potash	Nitrate soda	Acid phosphate	Muriate potash	Nitrate soda
	Rotation I: Corn–oats–wheat–clover									
	On Corn				On Oats			On Wheat		
1										
2	200				100			200		
3	200	50			100	20		200	20	
4										
5	200	50	50		100	20	30	200	20	80
6	200	50	50	*	100	20	30	200	20	80
7										
8	Manure, 8 tons							200	50	50
9	Manure, 8 tons, phosphated							200	50	50
10										
	Rotation II: Corn–soybeans–wheat–clover									
	On Corn				On Soybeans			On Wheat		
1										
2	200				100			200		
3	200	50			100	20		200	20	
4										
5	200	50	50		100	20	30	200	20	80
6	130	50	20		70	20	10	160	20	20
7										
8	160	20	20		100			170		30
9	160	20	20	†	100			170		30
10										

*Sugar factory lime, 2 tons. †Catch crop to follow corn.

Fertilizers and manure on corn.—Four corn crops have been grown in Rotations I and II with as yet no evidence of any benefit from the fertilizers. On the contrary, the outcome would seem to indicate injury, rather than benefit. It seems more probable, however, that the treatment has had no effect, either beneficial or injurious.

It is difficult to understand this outcome, for the crop yields have not been so large but that some further increase was possible. The unfertilized yields, it is true, are larger than those in the Miami County tests, for example, but whereas some of the land treated with acid phosphate has reached a 4-year average of 59 bushels per acre in the Miami County test, the yield from the same treatment has averaged only 45 bushels in the Paulding County test. Untreated manure has brought up the yield to 59.87 bushels and phosphated manure to 63.54 bushels in Miami County, while the

same treatments in Paulding County have raised the yield only to 52.91 bushels and 47.18 bushels, respectively. Acid phosphate has apparently reduced the yield in Paulding County, both when used alone and when mixed with manure.

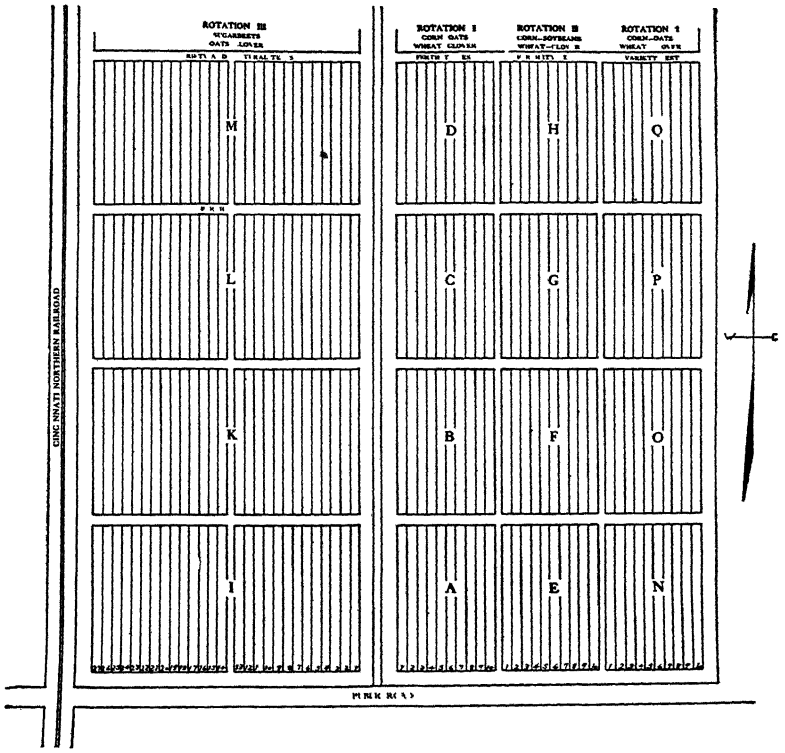


Diagram V.—Arrangement of plots, Paulding County Experiment Farm
Plots one-tenth acre

The short rotation of corn and oats, started in 1915 (Table XVII), shows yields of corn reaching 75 bushels after phosphated manure, but some of the unfertilized yields in this test reach 73 bushels or more, while on the thin, high upland of the Wayne County farm of the Experiment Station a 12-year average yield of 78 bushels per acre has been maintained on four 10-acre fields.

The State statistics of crop production, as collected by the township assessors and compiled by the State Department of Agriculture, show an average yield of corn per acre for the 10 years, 1900-1909, of 38.6 bushels in Paulding County as against 43.7 bushels for the same period in Miami County. Evidently there is something yet to be learned respecting the production of corn on Paulding County soil.

TABLE XVI.—Fertilizers and manure on CORN, Paulding County Experiment Farm

Plot	Treatment per acre	1915				4-year average				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	
	Rotation I: Corn–oats–wheat–clover. Block A									
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	50.00	2,925	.....	.....	50.07	3,406	.....	.....	1
2	Acid phosphate, 200 lb	51.43	3,000	.95	.....	47.36	3,475	−4.26	.....	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	50.57	3,560	− .38	485	46.84	3,790	−6.31	246	3
4	None	51.43	3,150	.....	.....	54.69	3,612	.....	.....	4
5	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb	53.57	3,750	1.43	550	53.82	3,869	− .02	294	5
6	Acid phos., 200 lb.; mur. potash, 50 lb.; nit. soda, 50 lb.; sugar factory lime, 2 tons	53.57	3,350	.71	100	48.89	3,750	−4.09	212	8
7	None	53.57	3,300	.....	.....	52.12	3,500	.....	.....	7
8	Untreated manure, 8 tons	51.57	2,915	−1.43	−332	52.91	3,604	1.02	75	8
9	Phosphated manure, 8 tons	54.43	3,410	2.00	217	47.18	3,952	−4.47	396	9
10	None	51.86	3,140	.....	.....	51.41	3,585	.....	.....	10
	Average unfertilized yield	51.71	3,129	.....	.....	52.07	3,526	.....	.....	
	Rotation II: Corn–soybeans–wheat–clover. Block E									
1	None	53.43	3,210	.....	.....	47.95	3,220	.....	.....	1
2	Acid phosphate, 200 lb	49.29	3,050	−3.81	−193	42.91	3,233	−4.75	52	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	47.86	2,970	−4.90	−307	42.00	3,273	−5.35	131	3
4	None	52.43	3,310	.....	.....	47.05	3,103	.....	.....	4
5	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb	50.71	3,450	− .81	128	50.86	3,650	2.21	387	5
6	Acid phosphate, 130 lb.; muriate potash, 50 lb.; nitrate soda, 20 lb	45.71	3,200	−4.91	−133	46.76	3,317	−3.49	−105	6
7	None	49.71	3,345	.....	.....	51.85	3,582	.....	.....	7
8	Acid phosphate, 160 lb.; muriate potash, 20 lb.; nitrate soda, 20 lb.	55.14	4,090	4.38	720	49.86	3,730	−1.83	251	8
9	Acid phosphate, 160 lb.; muriate potash, 20 lb.; nitrate soda, 20 lb.*	60.00	3,930	8.19	535	49.64	3,743	−1.88	367	9
10	None	52.86	3,420	.....	.....	51.36	3,273	.....	.....	10
	Average unfertilized yield	52.11	33.21	.....	.....	49.56	3,294	.....	.....	

*Catch crops to follow corn.

TABLE XVII.—Fertilizers and manure on CORN, Paulding County Experiment Farm

Rotation IV: Corn-oats. Block Q

Plot	Treatment per acre	Yield per acre		Increase per acre		Plot
		Grain	Stover	Grain	Stover	
		Bu.	Lb.	Bu.	Lb.	
1	None	52.86				1
2	Acid phosphate, 200 lb	66.43		7.86		2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	66.43		2.14		3
4	None	70.00				4
5	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb	65.71		— .96		5
6	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.; lime 2 tons	71.72		8.39		6
7	None	60.00				7
8	Manure, 8 tons	72.85		8.33		8
9	Phosphated manure, 8 tons	75.71		6.66		9
10	None	73.57				10
	Average unfertilized yield	64.11				

TABLE XVIII.—Fertilizers and manure on OATS, Paulding County Experiment Farm

Rotation I: Corn-oats-wheat-clover. Block D

Plot	Treatment per acre	1915				4-year average				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	61.41	3,135			49.45	3,030			1
2	Acid phosphate, 100 lb	56.56	2,840	— 7.30	—367	48.24	2,969	—1.64	— 99	2
3	Acid phosphate, 100 lb.; muriate potash, 20 lb	55.94	2,810	—10.36	—468	51.17	2,621	,86	—485	3
4	None	68.75	3,350			50.74	3,145			4
5	Acid phosphate, 100 lb.; muriate potash, 20 lb.; nitrate soda, 30 lb	68.44	3,410	2.40	107	54.61	2,871	4.91	—109	5
6	Acid phosphate, 100 lb.; muriate potash, 20 lb.; nitrate soda, 30 lb	62.19	3,0E0	— 1.14	—197	52.58	2,900	3.92	84	6
7	None	60.62	3,210			47.61	2,651			7
8	Manure on corn	59.06	3,210	.48	40	47.18	2,809	.16	231	8
9	Phosphated manure on corn	58.44	3,030	— 1.56	—100	46.09	2,431	— .52	—311	9
10	None	59.69	3,090			48.12	2,835			10
	Average unfertilized yield	62.62	3,196			48.98	2,915			

TABLE XIX.—Residual effect on OATS of fertilizers applied to sugarbeets, Paulding County Experiment Farm

Rotation III: Beets-oats-clover. Block I

Plot	Treatment per acre	1915				4-year average*				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	71.25	3,720	.....	.....	53.79	3,966	.....	.....	1
2	Acid phosphate, 600 lb	71.25	3,595	— .83	—248	50.04	3,025	—3.25	—808	2
3	Muriate potash, 200 lb.	72.66	3,075	— .26	—892	50.47	3,216	—2.33	—483	3
4	None	73.75	4,090	.....	.....	52.30	3,566	.....	.....	4
5	Nitrate soda, 200 lb	72.34	3,535	.15	—322	49.76	3,940	—1.33	589	5
6	Acid phosphate, 600 lb.; nitrate soda, 200 lb	70.00	3,610	— .62	— 13	51.33	3,231	1.45	96	6
7	None	69.06	3,390	.....	.....	48.67	2,920	.....	.....	7
8	Acid phosphate, 600 lb.; muriate potash, 200 lb.	69.37	3,830	1.77	277	52.46	3,591	4.28	677	8
9	Muriate potash, 200 lb.; nitrate soda, 200 lb.	62.50	2,900	—3.65	—817	47.97	3,502	.28	594	9
10	None	64.69	3,880	.....	.....	47.19	2,902	.....	.....	10
11	Acid phos., 600 lb.; mur. potash, 200 lb ; nit. soda, 200 lb.	66.25	3,830	2.29	—140	49.53	3,729	2.53	615	11
12	Acid phos., 600 lb.; mur. pot., 200 lb.; nit. soda, 200 lb.; sugar factory lime, 2 tons	68.75	4,000	5.52	— 60	52.54	3,656	5.74	332	12
13	None	62.50	4,150	.....	.....	46.60	3,535	.....	.....	13
14	Sugar factory lime, 2 tons	69.06	3,540	5.89	—672	44.84	2,582	2.71	—241	14
15	Floats, 1,200 lb	66.56	3,320	2.71	—953	52.35	3,720	6.26	510	15
16	None	64.52	4,335	.....	.....	45.83	3,047	.....	.....	16
17	Yard manure, 10 tons	70.47	3,295	5.43	—707	46.30	2,952	5.16	332	17
18	Fresh manure, 10 tons	69.06	3,940	3.49	272	44.17	2,797	2.24	58	18
19	None	66.09	3,335	.....	.....	42.71	2,857	.....	.....	19
20	Fresh manure, 10 tons; sugar factory lime, 2 tons	72.02	3,745	4.89	293	46.30	2,828	3.71	20	20
21	Fresh manure, 10 tons; acid phosphate, 300 lb.	64.69	3,730	—3.49	162	43.44	3,102	.96	342	21
22	None	69.22	3,685	.....	.....	42.36	2,712	.....	.....	22
23	Mixed fertilizer, 2-8-2, 500 lb	70.78	3,835	.15	345	45.99	3,028	2.33	303	23
24	Acid phos., 287 lb.; mur. potash, 20 lb.; nit. soda, 52 lb.	66.41	3,675	—5.62	380	43.80	2,675	—1.15	— 65	24
25	None	73.44	3,100	.....	.....	46.25	2,753	.....	.....	25
26	Acid phos., 300 lb.; mur. potash, 100 lb.; nit. soda, 100 lb.	67.34	3,545	—6.10	445	44.06	2 717	—2.19	— 37	26
27	Steamed bonemeal, 175 lb.; mur potash, 100 lb.; nit. soda, 67 lb.	70.62	2,690	—2.82	—410	44.95	2,562	—1.30	—192	27
	Average unfertilized yield	68.28	3,743	.....	.....	49.00	3,329	.....	.....	

*The average yields and increases for Plots 14 to 27, inclusive, Rotation III, are for 3 years, 1913, 1914 and 1915.

Fertilizers and manure on oats.—The 4-year average unfertilized yield of oats has been 49 bushels per acre, both after corn and after sugarbeets. Some of the fertilizer treatments seem to have increased the yield slightly, but with oats as with corn the differences in yield have been too irregular to justify the assumption that they have been due to the treatment.

In the duplicate experiment, in which oats follows corn on the Miami County Experiment Farm, the unfertilized yield of oats has averaged 49.41 bushels per acre for the same 4-year period, and some of the fertilizers have increased the yield by 10 bushels per acre.

Fertilizers and manure on wheat.—The unfertilized yield of wheat averaged 43.10 bushels per acre in Rotation I and 32.08 bushels in Rotation II and has averaged 37.52 and 37.43 bushels, respectively, for the 3 years, 1913-1915. In 1915 the yield after the complete fertilizers and manure in Rotation I ranged from 47.4 to 48.3 bushels, while in Rotation II there was an average increase of more than 10 bushels per acre from all the fertilizing treatments. In the 3-year average yields on the fertilized or manured land have been several bushels higher than on the unfertilized land in every case but one. To obtain such an increase in wheat over the very large unfertilized yields is as surprising as it is to fail to obtain any increase on the relatively much lower yields of corn, for as a general rule throughout the middle belt of Ohio—a region almost equally adapted to corn and wheat—we expect to obtain more than twice as many bushels of corn as of wheat to the acre. Taking the State as a whole, the 60-year average yields have been about 14 bushels of wheat and 35 bushels of corn, and in Paulding County the average yields for the 10 years, 1900-1909, have been 16.4 bushels of wheat as against 38.6 bushels of corn.

The soil of the Paulding County Experiment Farm would seem to be well adapted to wheat, if we may judge by the three crops here reported; but the crop sown in the fall of 1915 was not seeded until late and was entirely destroyed by the winter conditions following.

Fertilizers and manure on soybeans.—The soybeans, like the corn and oats, have shown practically no response to fertilizing, although the yield has not been near the upper limit of the possible production of this crop.

TABLE XX.—Fertilizers on SOYBEANS, Paulding County Experiment Farm

Plot	Treatment per acre	1915				3-year average				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Rotation II: Corn-soybeans-wheat-clover. Block H									
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	15.17	1,790	.....	.....	18.53	1,840	.....	.....	1
2	Acid phosphate, 100 lb	15.67	1,460	— .67	—360	19.03	1,702	.31	—160	2
3	Acid phosphate, 100 lb.; muriate potash, 20 lb	17.00	1,730	— .50	—220	20.08	1,850	1.18	— 35	3
4	None	18.67	1,880	.....	.....	19.08	1,907	.....	.....	4
5	Acid phosphate, 100 lb.; muriate potash, 20 lb.; nitrate soda, 20 lb.	17.83	2,030	— .84	150	20.30	2,150	1.26	252	5
6	Acid phosphate, 70 lb.; muriate potash, 20 lb.; nitrate soda, 10 lb	17.17	1,820	—1.50	— 60	19.36	1,947	.37	60	6
7	None	18.67	1,880	.....	.....	18.95	1,877	.....	.....	7
8	Acid phosphate, 100 lb	19.67	1,920	1 06	53	20.61	1,902	1.45	6	8
9	Acid phosphate, 100 lb	20.17	2,040	1.61	187	20.45	1,363	1.08	131	9
10	None	18.50	1,840	.....	.....	19.58	1,932	.....	.....	10
	Average unfertilized yield	17.75	1,850	.....	.....	19.03	1,915	.....	.....	

TABLE XXI.—Fertilizers and manure on WHEAT, Paulding County Experiment Farm

Plot	Treatment per acre	1915				3-year average				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Rotation I: Corn-oats-wheat-clover. Block C									
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	43.67	4,730	.....	.....	41.94	3,805	.....	.....	1
2	Acid phosphate, 200 lb	41.00	4,490	—3.22	—337	36.05	3,537	—4.40	209	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb	43.17	4,660	—1.61	—263	36.61	3,585	—2.36	102	3
4	None	45.33	5,020	.....	.....	37.49	3,628	.....	.....	4
5	Acid phosphate, 200 lb.; muriate potash, 20 lb.; nitrate soda, 80 lb	47.50	5,100	3.37	257	41.25	4,015	4.58	486	5
6	Acid phosphate, 200 lb.; muriate potash, 20 lb.; nitrate soda, 80 lb.*	47.42	4,955	4.49	288	39.61	3,777	3.71	348	6
7	None	41.73	4,490	.....	.....	35.10	3,330	.....	.....	7
8	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.†	48.33	5,150	6.62	840	41.11	4,095	5.86	816	8
9	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.‡	48.00	5,170	6.31	1,040	39.61	3,905	4.21	676	9
10	None	41.67	3,950	.....	.....	35.56	3,177	.....	.....	10
	Average unfertilized yield	43.10	4,547	.....	.....	37.52	3,485	.....	.....	
	Rotation II: Corn-soybeans-wheat-clover. Block G									
1	None	29.83	3,760	.....	.....	36.50	3,710	.....	.....	1
2	Acid phosphate, 200 lb	41.67	4,050	10.67	427	42.17	4,052	5 28	380	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb	42.83	4,230	10.67	743	42.50	4,225	5.22	590	3
4	None	33.33	3,350	.....	.....	37.67	3,597	.....	.....	4
5	Acid phosphate, 200 lb.; muriate potash, 20 lb.; nitrate soda, 80 lb	42.33	5,410	10.78	1,920	44.65	4,985	7.45	1,410	5
6	Acid phosphate, 160 lb.; muriate potash, 20 lb.; nitrate soda, 20 lb	45.50	4,470	15.72	840	42.90	4,585	6.15	1,032	6
7	None	28.00	3,770	.....	.....	36.29	3,530	.....	.....	7
8	Acid phosphate, 170 lb.; nitrate soda, 30 lb	44.33	4,290	13.27	387	43.83	4,692	6.56	840	8
9	Acid phosphate, 170 lb.; nitrate soda, 30 lb.§	44.00	4,510	9.89	473	42.45	4,820	4.18	645	9
10	None	37.17	4,170	.....	.....	38.25	4,497	.....	.....	10
	Average unfertilized yield	32.08	3,762	.....	.....	37.43	3,833	.....	.....	

*Lime carbonate on corn. †Untreated manure on corn. ‡Phosphated manure on corn. §Catch crop on corn.

TABLE XXII.—Fertilizers on SUGARBEETS, Paulding County Experiment Farm

Rotation III: Sugarbeets-oats-clover. Block K

Plot	Treatment per acre	1915		4-year average		Plot
		Yield per acre	Increase per acre	Yield per acre	Increase per acre	
		Tons	Tons	Tons	Tons	
1	None	21.550	.....	13.619	.....	1
2	Acid phosphate, 600 lb	21.450	.383	13.812	.214	2
3	Muriate potash, 200 lb	20.400	— .183	11.737	—1.839	3
4	None	20.100	.....	13.556	.....	4
5	Nitrate soda, 200 lb	20.900	1.400	14.006	1.069	5
6	Acid phosphate, 600 lb.; nitrate soda, 200 lb	21.150	2.250	13.769	1.450	6
7	None	18.300	.....	11.700	.....	7
8	Acid phosphate, 600 lb.; muriate potash, 200 lb	21.850	3.583	14.331	2.864	9
9	Muriate potash, 200 lb.; nitrate soda, 200 lb	20.150	1.917	13.350	2.117	8
10	None	18.200	.....	11.000	.....	10
11	Acid phosphate, 600 lb.; muriate potash, 200 lb.; nitrate soda, 200 lb	21.800	3.450	15.650	4.171	11
12	Acid phosphate, 600 lb.; muriate potash, 200 lb.; nitrate soda, 200 lb.; sugar factory lime, 2 tons	23.350	4.850	15.631	3.673	12
13	None	18.650	.....	12.437	.....	13
14	Sugar factory lime, 2 tons	*	.....	10.200	— .045	14
15	Floats, 1200 lb	*	.....	10.183	.061	15
16	None	20.300	.....	12.575	.....	16
17	Yard manure, 10 tons	23.600	2.750	13.900	1.302	17
18	Fresh manure, 10 tons	25.150	3.750	15.331	2.710	18
19	None	21.950	.....	12.644	.....	19
20	Fresh manure, 10 tons; sugar factory lime, 2 tons	25.100	3.717	14.669	1.693	20
21	Fresh manure, 10 tons; acid phosphate, 300 lb	24.800	3.983	15.269	1.960	21
22	None	20.250	.....	14.725	.....	22
23	Mixed fertilizer, 2-8-2, 500 lb	23.400	4.083	15.392	1.130	23
24	Acid phosphate, 287 lb.; muriate potash, 20 lb.; nitrate soda, 52 lb	20.850	2.467	14.517	.720	24
25	None	17.450	.....	13.333	.....	25
26	Acid phosphate, 300 lb.; muriate potash, 100 lb.; nitrate soda, 100 lb	20.550	3.100	14.350	1.017	26
27	Steamed bonemeal, 175 lb.; muriate potash, 100 lb.; nitrate soda, 67 lb	25.450	8.000	16.975	3.642	27
	Average unfertilized yield	19.506	.....	12.687	.....	

*The weights for Plots 14 and 15, 1915, were lost. Averages for 3 preceding years are given.

Fertilizers and manure on sugarbeets.—The sugarbeets made a large yield in 1915, and show an increase for every application of fertilizer except muriate of potash used alone. When the muriate is used in combination with acid phosphate or nitrate of soda, however, there is an additional increase over that produced by the phosphate or nitrate used without the potash salt.

In the 4-year average the outcome indicates a probability that some combinations of fertilizing materials may be used with advantage on this soil.

Residual effect of fertilizers and manure on clover.—Table XXIII reports the clover crops in the different rotations, and shows a very large yield, averaging more than 3½ tons per acre on the unfertilized land in Rotation I, and reaching nearly 5 tons on the manured land. With clover, as with the other crops, however, acid phosphate has failed to produce any increase in yield, both when used alone and when added to manure.

The sugar factory lime, as used in Rotation III, has injured, instead of benefiting the clover, the injury being so great as to be evident during the growth of the clover. The addition of the same lime to the complete fertilizer in Rotation I has also been followed by a slight reduction in the yield of clover.

It was not unexpected that this soil would fail to give any increase for lime, as the luxuriant growth of clover indicates a good supply of this constituent, but the apparently unfavorable effect is not yet understood.

COMPARISON OF TWO TYPICAL SOILS

The Paulding County Experiment Farm is located on the Clyde clay, a dark brown or almost black, heavy, silty clay, lying over a tenacious clay subsoil. It is exceptionally sticky when wet, and becomes unusually hard when dry, breaking up in clods which can be pulverized only after a rain. In periods of drouth it cracks open to a considerable depth, thus aggravating the effect of the drouth. Its flat topography and retentive subsoil retard drainage and increase the danger of winter injury to wheat.

In comparatively recent geologic times Paulding County was covered by a westward extension of Lake Erie, in the shallow waters of which its soil was formed by the commingling of clay and aquatic vegetation. After the water of the lake had receded, the land became a semimarsh, occupied finally with a forest growth consisting largely of elm and similar water-tolerant trees.

TABLE XXIII.—Residual effect on CLOVER of fertilizers and manure applied to previous crops, Paulding County Experiment Farm

Plot	Treatment per acre Total fertilizers and manure on previous crops of the rotation	1915		2-year average		Plot
		Yield per acre	Increase per acre	Yield per acre	Increase per acre	
	Rotation I: Corn-oats-wheat-clover. Block B					
		Lb.	Lb.	Lb.	Lb.	
1	None	7,453		5,717		1
2	Acid phosphate, 500 lb	7,452	— 29	5,948	47	2
3	Acid phosphate, 500 lb.; muriate potash, 90 lb	7,916	407	6,402	319	3
4	None	7,537		6,266		4
5	Acid phosphate, 500 lb.; muriate potash, 90 lb ; nitrate soda, 160 lb	9,094	1,374	7,102	781	5
6	Acid phos., 500 lb.; mur. potash, 90 lb.; nit. soda, 160 lb.; sugar factory lime, 2 tons	8,568	666	6,706	329	6
7	None	8,085		6,431		7
8	Acid phos., 200 lb.; mur. potash, 50 lb.; nit. soda, 50 lb.; untreated manure, 8 tons	9,937	2,021	7,710	1,315	8
9	Acid phos., 200 lb.; mur. potash, 50 lb.; nit. soda, 50 lb.; phosphated manure, 8 tons	8,421	673	6,588	229	9
10	None	7,579		6,323		10
	Average unfertilized yield	7,663		6,184		
	Rotation II: Corn-soybeans-wheat-clover. Block F					
1	None	7,074		5,839		1
2	Acid phosphate, 500 lb	8,464	870	6,641	509	2
3	Acid phosphate, 500 lb.; muriate potash, 90 lb	8,547	435	6,651	228	3
4	None	8,632		6,716		4
5	Acid phosphate, 500 lb.; mur. potash, 90 lb ; nit. soda, 160 lb	8,211	— 463	6,639	— 194	5
6	Acid phos., 360 lb.; mur. potash, 90 lb.; nit. soda, 160 lb.; sugar factory lime, 2 tons	9,179	463	7,211	261	6
7	None	8,758		7,068		7
8	Acid phos., 430 lb.; mur. potash, 20 lb.; nit soda, 50 lb	8,800	14	7,178	185	8
9	Acid phos., 430 lb.; mur. potash, 20 lb.; nit soda, 50 lb	9,179	365	7,011	93	9
10	None	8,842		6,843		10
	Average unfertilized yield	8,326		6,616		

TABLE XXIII.—Residual effect on CLOVER of fertilizers and manure applied to previous crops, Paulding County Experiment Farm—Concluded

Rotation III.—Sugarbeets-oats-clover. Block L

Plot	Treatment per acre Total fertilizers and manure on previous crops of the rotation	1915		2-year average		Plot
		Yield per acre	Increase per acre	Yield per acre	Increase per acre	
		Lb.	Lb.	Lb.	Lb.	
1	None	8,000		8,276		1
2	Acid phosphate, 600 lb	7,916	— 112	7,881	— 392	2
3	Muriate potash, 200 lb	7,916	— 140	7,910	— 360	3
4	None	8,084		8,267		4
5	Nitrate soda, 200 lb	8,526	456	8,077	34	5
6	Acid phosphate, 600 lb.; nitrate soda, 200 lb	7,811	— 245	7,317	— 504	6
7	None	8,042		7,597		7
8	Acid phosphate, 600 lb.; muriate potash, 200 lb	8,505	659	7,783	437	8
9	Muriate potash, 200 lb.; nitrate soda, 200 lb	8,105	456	7,541	446	9
10	None	7,453		6,844		10
11	Acid phosphate, 600 lb.; muriate potash, 200 lb.; nitrate soda, 200 lb	7,726	119	8,894	1,642	11
12	Acid phos., 600 lb.; mur. potash, 200 lb.; nit. soda, 200 lb., sugar factory lime, 2 tons	7,116	— 646	6,647	—1,015	12
13	None	7,916		8,070		13
14	Sugar factory lime, 2 tons	6,863	—1,095	6,482	—1,149	14
15	Floats, 1,200 lb	7,326	— 674	8,507	1,315	15
16	None	8,042		6,752		16
17	Yard manure, 10 tons	7,326	— 505	8,322	1,231	17
18	Fresh manure, 10 tons	7,789	168	7,257	— 173	18
19	None	7,410		7,769		19
20	Fresh manure, 10 tons; sugar factory lime, 2 tons	7,705	393	7,173	— 340	20
21	Fresh manure, 10 tons; acid phosphate, 300 lbs	7,747	533	7,097	— 158	21
22	None	7,116		6,998		22
23	Mixed fertilizer, 2-8-2, 500 lb	7,495	344	7,236	405	23
24	Acid phosphate, 287 lb.; muriate potash, 20 lb.; nitrate soda, 52 lb	7,600	414	6,742	78	24
25	None	7,221		6,498		25
26	Acid phosphate, 300 lb.; muriate potash, 100 lb.; nitrate soda, 100 lb	7,663	442	6,814	317	26
27	Steamed bonemeal, 175 lb.; muriate potash, 100 lb.; nitrate soda, 67 lb	8,042	821	6,910	413	27
	Average unfertilized yield	7,698		7,452		

TABLE XXIV.--Fertilizers and manure on cereal crops grown in rotation, Paulding County Experiment Farm. Average value of increase, cost of fertilizers and net gain per acre for one rotation

Plot	Treatment per acre Total fertilizers and manure for one 4-year rotation	Average increase per acre							Total value of increase	Cost of fertilizer	Net gain	Plot
		Corn		Oats or soybeans		Wheat		Clover				
		Grain	Stover	Grain	Straw*	Grain	Straw					
	Rotation I: Corn-oats-wheat-clover.											
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Lb.	Dollars	Dollars	Dollars	
1	None											1
2	Acid phosphate, 500 lb	−4.26	0	−1.64	− 99	4.40	209	47	1.62	3.50	− 1.88	2
3	Acid phosphate, 500 lb.; muriate potash, 90 lb	−6.31	246	.86	−485	−2.36	102	319	−2.89	5.75	− 8.64	3
4	None											4
5	Acid phosphate, 500 lb.; muriate potash, 90 lb.; nitrate soda, 160 lb	− .02	294	4.91	−109	4.58	486	781	8.92	10.55	− 1.63	5
6	Acid phos., 500 lb.; mur. pot., 90 lb.; nit. soda, 160 lb.; sugar factory lime, 2 tons	−4.09	212	3.92	84	3.71	348	329	4.57	16.55	−11.98	6
7	None											7
8	Acid phos., 200 lb.; mur. potash, 50 lb.; nit. soda, 50 lb.; manure, 8 tons	1.02	75	.16	231	5.86	816	1,315	11.56	8.15	3.41	8
9	Acid phos., 200 lb.; mur. pot., 50 lb.; nit. soda, 50 lb.; phosphated manure, 8 tons	−4.47	396	− .52	−311	4.21	676	229	3.30	10.40	− 7.10	9
10	None											10
	Rotation II: Corn-soybeans-wheat-clover.											
1	None											1
2	Acid phosphate, 500 lb	−4.75	52	.31	−160	5.28	380	509	4.97	3.50	1.47	2
3	Acid phosphate, 500 lb.; muriate potash, 90 lb	−5.35	131	1.18	− 35	5.22	590	−228	4.88	5.75	− .87	3
4	None											4
5	Acid phos., 500 lb.; mur. potash, 90 lb.; nit. soda, 160 lb	2.21	387	1.26	252	7.45	1,410	−194	9.57	10.55	− .98	5
6	Acid phos., 360 lb.; mur. potash, 90 lb.; nit. soda, 50 lb	−3.49	−105	.37	60	6.15	1,032	261	5.87	6.27	− .40	6
7	None											7
8	Acid phos., 430 lb.; mur. potash, 20 lb.; nit. soda, 50 lb	−1.83	251	1.45	6	6.56	840	185	7.93	5.00	2.93	8
9	Acid phos., 430 lb.; mur. potash, 20 lb.; nit. soda, 50 lb. Catch crop	−1.88	367	1.08	131	4.18	645	93	5.37	10.00	−4.63	9
10	None											10

*Soybean straw for 1914 and 1915 crops.

TABLE XXV.—Fertilizers, manure and lime on SUGARBEETS, OATS and CLOVER, Paulding County Experiment Farm.
Average value of increase, cost of fertilizers and net gain per acre

Plot	Treatment per acre (on sugarbeets)	Average increase per acre				Total value of increase*	Total cost of fertilizers	Net gain	Plot
		Sugar-beets	Oats		Clover				
			Grain	Straw					
		Tons	Bu.	Lb.	Lb.	Dollars	Dollars	Dollars	
1	None								1
2	Acid phosphate, 600 lb	0.214	—3 25	—808	— 392	— 2.42	4.20	— 6.62	2
3	Muriate of potash, 200 lb	—1.839	—2.33	—483	— 360	—10.59	5.00	—15.59	3
4	None								4
5	Nitrate soda, 200 lb	1.069	—1.33	589	34	4.96	6.00	— 1.04	5
6	Acid phosphate, 600 lb.; nitrate soda, 200 lb	1.450	1.45	96	— 504	4.79	10.20	— 5.41	6
7	None								7
8	Acid phosphate, 600 lb.; muriate potash, 200 lb	2.864	4.28	677	437	16.12	9.20	6.92	8
9	Muriate potash, 200 lb.; nitrate of soda, 200 lb	2.117	.28	594	446	11.64	11.00	.64	9
10	None								10
11	Acid phosphate, 600 lb.; muriate potash, 200 lb.; nitrate soda, 200 lb	4.171	2.53	615	1,642	26.02	15.20	10.82	11
12	Acid phos., 600 lb.; mur. potash, 200 lb.; nit. soda, 200 lb.; sugar factory lime, 2 tons	3.673	5.74	332	— 1,015	13.91	18.20	4.29	12
13	None								13
14	Sugar factory lime, 2 tons	†—.045	2.71	—241	—1,149	— 4.27	3.00	— 7.27	14
15	Floats, 1,200 lb	†—.061	6.26	510	1,315	7.91	6.00	1.91	15
16	None								16
17	Yard manure, 10 tons	1.302	5.16	332	1,231	12.44	5.00	7.44	17
18	Fresh manure, 10 tons	2.710	2.24	58	— 173	11.78	5.00	6.78	18
19	None								19
20	Fresh manure, 10 tons; sugar factory lime, 2 tons	1.693	3.71	20	— 340	7.11	8.00	— .89	20
21	Fresh manure, 10 tons; acid phosphate, 300 lb	1.960	.96	342	— 158	8.49	7.00	1.49	21
22	None								22
23	Mixed fertilizer, 2–8–2, 500 lb	1.130	2.33	303	405	7.52	5.40	2.12	23
24	Acid phosphate, 287 lb.; muriate potash, 20 lb.; nitrate soda, 52	.720	—1.15	— 65	78	3.02	4.07	— 1.05	24
25	None								25
26	Acid phosphate, 300 lb.; muriate potash, 100 lb.; nitrate soda, 100 lb	1.017	—2.19	— 37	317	4.98	7.60	— 2.62	26
27	Steamed bonemeal, 175 lb.; muriate potash, 100 lb.; nitrate soda, 67 lb	3.642	—1.30	—192	413	16.89	7.00	9.89	27

*Prices used in computing value of increase and cost of treatment: Sugarbeets, $5 per ton; 2-8-2 fertilizer, $21.60 per ton; steamed bonemeal, $28.80 per ton; muriate potash, 2¼ per lb.; nitrate soda, 3 cents per lb.; acid phosphate, $14 per ton; floats, $10 per ton; manure 50 cents per ton, and sugar factory lime, $1.50 per ton.

†Sugarbeets on Plots 14 and 15 for 1915 not included.

This was the condition in which the white man found the county; a condition necessitating not only the removal of the forest, but also extensive and systematic drainage. Half a century ago elm was considered a very inferior timber. It was difficult to split it into rails; it did not make durable posts or railroad ties; when sawed into lumber it would warp out of shape if exposed to the weather. Moreover, at that time the drainage laws of the State were very defective; there was no adequate provision for general drainage, and the individual farmer who did not possess an outlet on his own land was at the mercy of those who owned the land below him.

Naturally, the lands which could be brought under the plow with the least expenditure were the first to be occupied, and this region remained sparsely settled until well into the last quarter of the century. By this time the diminishing supplies of timber in other sections, the discovery of new uses for elm and the invention of improved machinery for working it, had increased its relative value; and legislation had been enacted which made systematic drainage possible. Consequently, a general development of the region set in which in a comparatively few years completely revolutionized its agricultural conditions.

TABLE XXVI.—Crops in Paulding and Miami Counties, by 10-year periods. Total acres and average yields per acre

	Corn		Oats		Wheat	
Paulding County	Acres	Bu.	Acres	Bu.	Acres	Bu.
1850-50	2,810	31.8	345	13.4	1,208	11.1
1860-69	4,690	28.9	861	19.7	3,493	10.9
1870-79	9,656	29.3	3,026	26.2	5,805	12.8
1880-89	13,565	31.4	4,248	28.3	11,772	12.5
1890-99	32,122	38.1	9,013	32.9	16,952	12.9
1900-09	46,710	38.6	31,603	35.6	13,101	16.4
Miami County						
1850-59	38,483	33.1	8,543	18.6	27,392	15.3
1860-69	38,662	34.3	9,906	19.1	35,784	14.2
1870-79	48,501	38.8	11,920	28.3	36,044	15.1
1880-89	50,084	40.4	9,278	32.6	48,594	16.3
1890-99	47,768	37 4	13,424	32.6	47,352	16.6
1900-09	54,290	43.7	23,040	35.9	38,251	15.4

The growth of the agriculture of Paulding County is illustrated by Table XXVI, which gives by decennial periods the acreage and yield per acre of the principal crops since 1850, and for comparison, the same data for Miami County. The table shows that the development of Paulding County's agriculture practically began with the eighties, but even at the end of the century there were fewer acres in cultivation than Miami County had during the fifties. Agriculturally, therefore, Paulding County is a new country; newer than

Illinois or Iowa, or even eastern Kansas and Nebraska, and the problem here is how best to maintain or increase the productiveness of a naturally fertile soil.

COMPARISON OF VARIETIES

DEPARTMENT OF AGRONOMY

Corn.—Eight varieties of corn have been tested for a period of 3 years, with the result that Wheeler's Reid stands highest in yield; Cook's 75, another strain of Reid, second; and Wheeler's Clarage, third. The Leaming, which stood highest in 1915, is sixth as a 3-year average.

Attention is called to a 1-year's test of number of plants per hill, in which the yield increases quite regularly from two to four plants per hill. Seasonal conditions affect this matter so much that this test must be continued over a number of years to possess much value.

TABLE XXVII.—Comparison of varieties of CORN, Paulding County Experiment Farm

Variety	Yield of grain per acre (bushels)				3-year average yield of stover per acre (pounds)
	1915	1914	1913	3-year average	
Reid (Morrisy)	73.58	49.22	40.97	54.59	4,228
Reid (Orcutt)	82.07	54.97	45.97	61.00	4,067
Reid (Wheeler)	77.25	67.53	47.36	64.05	4,127
Cook's 75	82.89	58.27	50.79	63.98	4,017
Ohio 84	75.00	48.22	48.54	57.25	3,453
Clarage (Wheeler)	73.35	61.72	51.50	62.19	3,417
Leaming	85.07	45.65	46.44	59.05	3,352
Darke County Mammoth	80.86	52.36	44.76	59.33	4,425

Rates of planting corn—1915

Number of stalks per hill	Yield per acre	Nubbins
	Bushels	Percent
Two	64.29	4.4
Three (average of 2 plots)	70.71	5.2
Four	77.14	7.9

Oats.—The test of 1915 included eight varieties of oats and one of barley. Seven of the varieties of oats have been tested for 4 seasons, one for 3 seasons and the barley for 2. In the 4-year average yield of grain per acre, Ohio 6222, a pure line selection of the Improved American, gives the largest yield, with the Little White second and the Big Four third. The Wideawake gives the largest yield of straw, with the Little White second and the Swedish Select third.

The Oderbrucker barley has given a 2-year average yield of 37.97 bushels per acre.

TABLE XXVIII.—Comparison of varieties of OATS, Paulding County Experiment Farm

Variety	Yield of grain per acre (bushels)					4-year average yield of straw per acre (pounds)
	1915	1914	1913	1912	4-year average	
Big Four	81.62	48.29	46.30	67.77	60.99	2,266
Silvermine	77.09	37.76	38.96	69.95	55.94	2,379
Swedish Select	78.65	42.76	26.77	69.27	54.36	2,784
Little White (local)	79.28	57.14	44.11	69.03	62.39	2,787
Ohio 7009 (Sixty Day)	69.27	36.03	.....	59.33	*54.88	*2,118
Ohio 6203 (Siberian)	80.83	46.11	27.87	71.88	56.67	2,252
Ohio 6222 (Improved American)	85.21	53.06	36.93	77.80	63.25	2,759
Wideawake	63.96	42.60	38.02	64.96	52.38	2,895
Oderbrucker barley	89.38	26.56	.....	.....	†37.97	†1,827

*3-year average.
†2-year average.

Wheat.—The wheat test includes nine varieties, all of which have been tested the full period of 3 years. The variety highest in yield, as an average of the 3 years, is the Trumbull, with the Gladden a close second and the Nigger third. These three highest in yield average 42.86 bushels per acre, while the three lowest—viz, the Mediterranean, Goens and Rudy—average 34.41 bushels per acre, a difference of 8.45 bushels per acre. Much of the profit in growing wheat would lie in this extra 8.45 bushels per acre.

While Paulding County shows up remarkably well, as compared with the other county experiment farms, in yield of wheat, it should be remembered that it is a county of extremes as to wheat production. It is a good yield, or nothing, apparently. Of the 5 consecutive years, 1912-1916, the wheat crop was an utter failure in 2, viz 1912 and 1916, and was seeded to oats. If these years be counted as lost, and the total yield of the best variety, Trumbull, for the 3 years be divided by 5, instead of 3, the average would be about 26 bushels per acre, with two good oat crops thrown in.

TABLE XXIX.—Comparison of varieties of WHEAT, Paulding County Experiment Farm

Variety	Yield of grain per acre (bushels)				3-year average yield of straw per acre (pounds)
	1915	1914	1913	3-year average	
Nigger	40.98	35.91	49.24	42.04	4,353
Gladden (Ohio 6100)	43.18	37.43	48.74	43.12	5,440
Mediterranean	28.47	29.62	40.31	32.80	3,648
Rudy	35.68	32.64	43.81	37.38	4,397
Turkey Red	42.99	35.81	45.01	41.27	4,757
Trumbull (Ohio 5309)	43.85	39.29	47.11	43.42	4,923
Portage (Ohio 6400)	32.12	38.44	54.84	41.80	4,245
Goens	26.55	33.58	39.04	33.06	5,200
Velvet Chaff	38.14	33.08	42.21	37.81	4 727

Soybeans.—Eight varieties of soybeans have been tested for 2 years, with the result that the Chestnut is highest in yield, with Ohio 9035 second and Ohio 7496 third. While the New Era cowpeas have been planted each year, they have not ripened for harvest.

TABLE XXX.—Comparison of varieties of SOYBEANS, Paulding County Experiment Farm

Variety	Color of beans	Yield of grain per acre (bushels)*			Yield of straw per acre (pounds)
		1914	1913	2-year average	
Mongol	Yellow	15.54	19.21	17.37	1,965
Ebony	Black	15.95	20.34	18.14	1,685
Chestnut	Yellow	21.51	28.49	25.00	2,300
Ohio 9100	Yellow	15.18	22.38	18.78	2,430
Ohio 9016	Yellow	18.24	16.77	17.50	2,330
Ohio 7496	Yellow	20.73	19.17	19.95	2,180
Ohio 9035	Brown	23.87	20.98	22.42	2,595
Medium Green	Green	13.79	13.67	13.73	1 933

*1915 test a failure on account of bad weather.

Sudan grass and millet.—In 1915 a test was conducted in which Sudan grass was compared with German millet. The Sudan grass was drilled solid in one case and with every other drill hoe in use in another. The test was made in duplicate. On the plots in which both were drilled solid the Sudan grass exceeded the German millet by an average of 1,250 pounds of hay per acre.

TABLE XXXI.—Comparison of SUDAN GRASS and MILLET, Paulding County Experiment Farm

Crop (1915)	Method of seeding	Yield per acre
		Pounds
Sudan grass	Drilled solid	10,100
Sudan grass	Every other hoe	9,000
German millet	Drilled solid	8,700
Sudan grass	Drilled solid	9,700
Sudan grass	Every other hoe	9,000
German millet	Drilled solid	8,600

PORK PRODUCTION EXPERIMENTS

DEPARTMENT OF ANIMAL HUSBANDRY

In the pork production work at the Paulding County Experiment Farm it is planned to allow the hogs to harvest a considerable part of the corn grown on the area devoted to swine and to have them make a rather large use of bluegrass, clover, alfalfa and rape. The oats will be harvested in the usual way, since oats are not usually economical for feeding to hogs. It is planned to have one small plot (2.5 acres) used continuously for the production of corn for "hogging down"; rape will be sown in this corn at about the time of the last cultivation to furnish valuable green feed for use with the corn.

THE CLERMONT COUNTY EXPERIMENT FARM

FOURTH ANNUAL REPORT, FOR THE YEAR 1915

VICTOR HERRON, AGENT IN CHARGE
HOWARD ELLIOTT, FARM FOREMAN

FARM IMPROVEMENTS

VICTOR HERRON

The farm improvements made during the year include the laying of 208 rods of draintile, the construction of 59 rods of fence and of an entrance gate, and the erection of a poultry house, 24 by 34 feet in size. The cost of these improvements is shown below:

Tile drainage:

Main—

474 feet 6 in.-clay tile at 3c	$ 14.22
451 feet 8 in.-concrete tile at 5½c	24.80
375 feet 10 in.-concrete tile at 7½c	28.12
Hauling 8 in. and 10 in. tile 8 miles, 32 hours at 40c	12.80
Hauling 6 in. tile 5 miles, 12 hours at 40c	4.80
Digging (hand) 88½ hours at 15c	13.27
Digging (hand) 57½ hours at 17½c	10.06
Laying, 20 hours at 17½c	3.50
Filling (man and team) 5 hours at 40c	2.00
Filling (1 man) 5 hours at 17½c	.87
Total	$114.44
Area drained by main, acres	26½
Average cost per acre for main	$4.31
Cost per rod for main	1.45

Laterals—

	Per rod
Tile, 4-inch, cents	28
Hauling 4 miles, do	5⅓
Cost of digging by machine 30 inches drop, do	21
Laying tile, do	1
Filling ditch, do	2

Cost per acre—Laterals 39 feet apart, $41.31; main added, $45.62

Cost per acre—Laterals 55 feet apart, $29.50; main added, $33.81

Fencing:

59 rods[1] (43 inches high) at 27c	$15.93
59 pounds barbed wire at 2½c	1.48
39 locust posts at 15c	5.85
20 Osage orange posts at 25c	5.00
4 end posts at 75c	3.00
Digging 59 holes, 15 hours at 15c	2.25
Setting 59 posts, 12 hours at 15c	1.80
Digging 4 end holes, 3½ feet—2 hours at 15c	.30
Setting 4 end posts, 1½ hours at 15c	.22
Stretching 59 rods fence, 8 hours at 15c	1.20
Stapling 59 rods fence, 3 hours at 15c	.45
Staples, 2 pounds at 3c	.06
Total	$37.54
Cost per rod	.64

[1]Top and bottom wires No. 9; intermediate and laterals No. 11; 10 horizontal wires; lateral stay wires 12 inches apart.

Entrance gate:		
625 pressed brick at $1.76 per hundred		$11.00
Hauling brick from city to farm		5.00
28 tile letters 4 in. x 6 in., packing and freight		5.34
Cement, 2¾ barrels at $2.20		6.05
Stone, gravel and sand, 5 loads		.50
Hauling (2 loads stone, 2 loads gravel, 1 load sand)		
15 man hours at 15c	$2.25	
30 horse hours at 10c	3.00	5.25
12-foot gate		5.25
3-foot gate		2.75
44 hours labor, building pillars at 30c		13.20
Total		$54.34
Poultry house:		
8 loads stone at 10c		$ 0.80
6 loads sand at 10c		.60
Hauling stone and sand, man hours, 42 at 15c		6.30
horse hours, 84 at 10c		8.40
Digging trench, 20 hours at 15c		3.00
Filling trench with stone, 10 hours at 15c		1.50
7 rods 4 inch-tile at 15c		1.05
Building cement base for feed bin 10 hours at 15c		1.50
Carpentry, 235 hours at 25c		58.75
Hardware, lock, hinges wire, etc		7.81
Cement, 1400 pounds at 45c		6.30
Lumber		126.40
Muslin, 3 yards at 16c		.48
Window sash, 12 at 85c		10.20
Window sash, 5 at $1.75		8.75
Total		$241.84

COST OF CRUSHING LIMESTONE ON THE FARM

In cooperation with the manufacturers of a portable-limestone crusher, a demonstration was given on the farm of crushing limestone for agricultural purposes. The cost of limestone crushed on the farm as compared with that shipped from Columbus, is shown below:

By purchasing:	
Ground limestone—55.9 tons at $1 (f. o. b. Columbus)	$ 55.90
Freight—Columbus to Batavia, 55.9 tons at $1	55.90
Hauling—Batavia to Experiment Farm, man and team, 12½ days at $4	50.00
Total cost	$161.80
Cost per ton	2.89
By crushing on the Farm:	
Limestone—14 loads at 10c	$ 1.40
Hauling (21 tons rock), man hours—42 at 20c	8.40
horse hours—84 at 10c	8.40
Labor—(3 men to work at crusher) 45 man hours at 15c	6.75
Engine hire—15 hours at $1	15.00
Charge for crusher (estimated)	7.50
Coal—1500 pounds at $3.85 per ton	2.89
Total cost	$ 50.34
Cost per ton	2.40

PASTURE IMPROVEMENT

It is proposed to leave the field immediately in front of the residence in permanent pasture. For the purpose of determining the best method of improving pastures, a number of plots were laid out and fertilized in various ways in the spring of 1914. Beginning at the driveway, the plots are numbered in duplicate, east and west, the treatment being the same for plots of the same number, except that Plot 1, west, received no grass seed in 1914. The treatment was as follows:

Plot 1—2 tons ground limestone, 10 tons manure and a mixture of 6 pounds redtop, 14 pounds bluegrass, 5 pounds timothy and 6 pounds alsike, per acre.
Plot 2—Plowed, 2 tons ground limestone, 300 pounds 4-8-6 fertilizer, and a mixture of 6 pounds redtop, 14 pounds bluegrass, 5 pounds timothy and 6 pounds alsike, per acre.
Plot 3—Disked, 2 tons ground limestone, 300 pounds 4-8-6 fertilizer and a mixture of 6 pounds redtop, 14 pounds bluegrass, 5 pounds timothy and 6 pounds alsike, per acre.
Plot 4—Check—Untreated.
Plot 5—200 pounds 16 percent acid phosphate.
Plot 6—250 pounds 12-5 fertilizer (acid phosphate and muriate of potash).
Plot 7—300 pounds 4-8-6 fertilizer, 6 pounds redtop.
Plot 8—2 tons ground limestone.
Plot 9—300 pounds 4-8-6 fertilizer, 6 pounds redtop, 14 pounds bluegrass, 5 pounds timothy and 6 pounds alsike, per acre.

The season of 1914 was extremely dry, and the grass did not make a good stand. In the spring of 1915 grass seed was sown on plots on which seed had been sown the previous year and the same fertilizer treatment given to all the plots as was given in 1914.

We note that the plots to which manure was applied do not heave out plants as badly as those having no manure. It is not yet safe to draw conclusions from the results of this work.

ORCHARD WORK

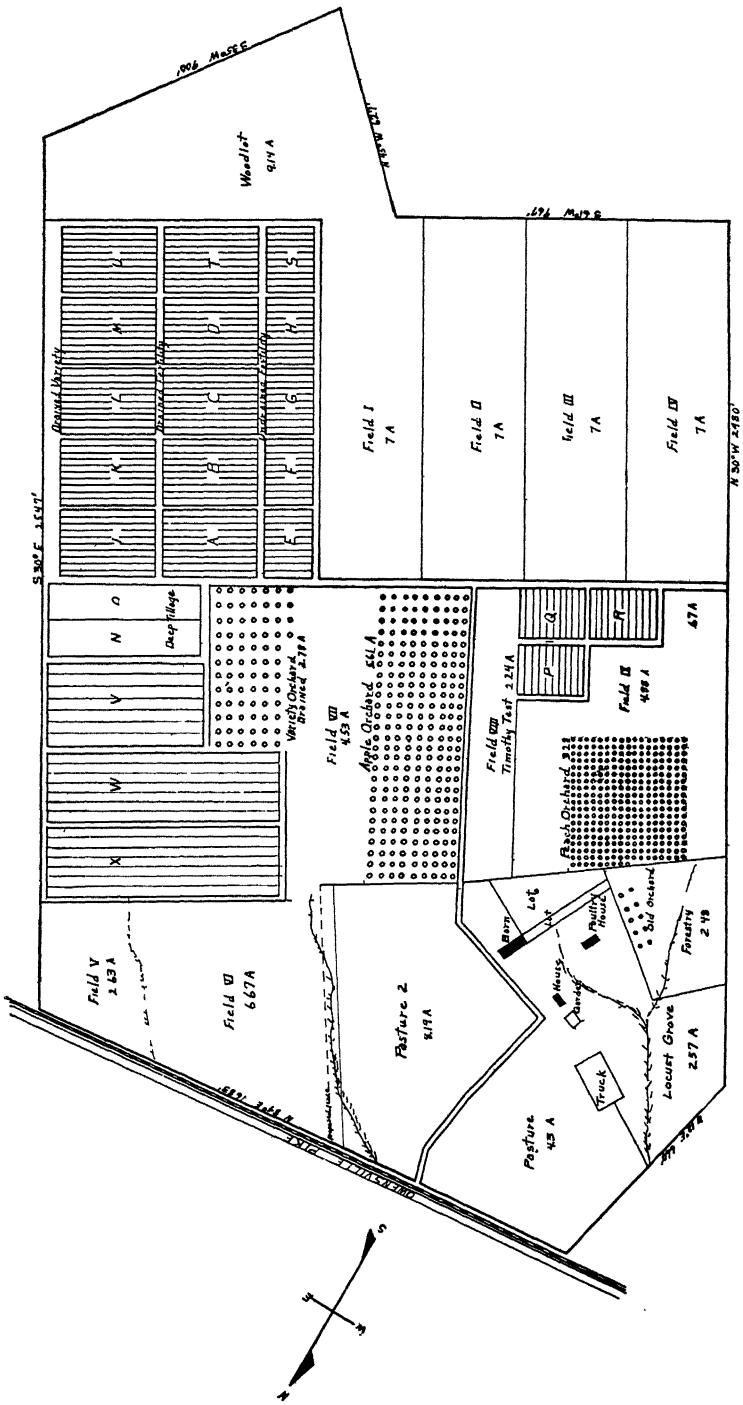
In the apple orchard planted in the spring of 1913 are 35 varieties and 320 trees for experiments in cultural methods. Thirty varieties of peach trees have also been planted on this farm.

EXPERIMENTS IN THE MAINTENANCE OF SOIL FERTILITY

DEPARTMENT OF SOILS

Four experiments with fertilizers and manure on crops grown in rotation are in progress on this farm; namely:

Rotation I: Corn, soybeans, wheat, clover, on drained land.
Rotation I: Corn, soybeans, wheat, clover, on undrained land.
Rotation II: Corn, soybeans, with cover crops between.
Rotation III: Potatoes, wheat, clover.



Sections A, B, C, D, I, K, L, M, U, T, 1/10 acre plots (272 ft. 3 in. x 16 ft.), paths 3 ft,
Sections E, F, G, H, S, P, Q, R, 1/20 acre plots (136 ft. 1 5 in. x 16 ft.), paths 3 ft,
Sections N, O, deep tillage, 1 acre each (437 ft. 3 in. x 99 ft. 7 in.), path 3¼ ft,
Section V, .33 acre plots (450 x 32), 2 ft. paths,
Sections W, X, .401 acre plots (680 x 26.66), 2 ft. paths.

Diagram VI.—Plan of Clermont County Experiment Farm

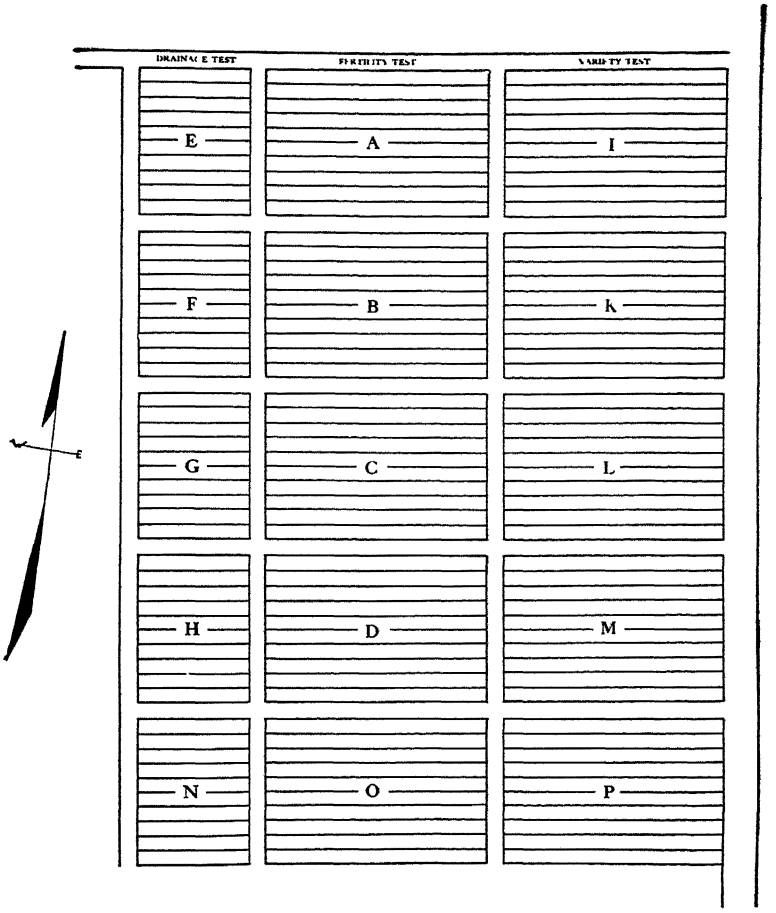


Diagram VII.—Arrangement of plots, Clermont County Experiment Farm.

Blocks A, B, C, D. Fertility tests on drained land
Blocks E, F, G, H. Fertility tests on undrained land
Blocks I, K, L, M. Variety tests (drained land)
Blocks N, O, P, additional tests
The plots in each block are numbered from 1 to 10, beginning at the north side

The plan of fertilizing in these rotations is given in Table XXXII, the treatment of Rotation I, drained and undrained land, being the same except for the drainage and the same as that of Rotation II on the Miami and Paulding County Experiment Farms. The arrangement of plots in these rotations is shown in Diagram VII.

TABLE XXXII.—Plan of fertilizing, Clermont County Experiment Farm

Pounds of fertilizing materials per acre for each crop

Plot	Acid phosphate	Muriate potash	Nitrate soda	Powdered limestone	Acid phosphate	Muriate potash	Nitrate soda	Acid phosphate	Muriate potash	Nitrate soda
	Rotation I: Corn–soybeans–wheat–clover									
	On Corn				On Soybeans			On Wheat		
1										
2	200				100			200		
3	200	50			100	20		200	20	
4										
5	200	50	50		100	20	30	200	20	80
6	200	50	50	4,000	100	20	30	200	20	80
7										
8	Manure, 8 tons, phosphated							200	50	50
9	Manure, 8 tons, phosphated			4,000				200	50	50
10										
	Rotation II: Potatoes—wheat—clover									
	On Potatoes				On Wheat					
1										
2	200				200					
3	200	50			200	50				
4										
5	200	50	50		200	50	50			
6	400	100	100		400	100	100			
7										
8	Untreated manure, 8 tons									
9	Untreated manure, 8 tons Acid phosphate, 200 lb.									
10										

Fertilizers and manure on corn.—Table XXXIII shows that in 1915 the unfertilized yields of corn were practically the same on the drained and on the undrained land. Where the complete fertilizer or manure was used, however, the yield was nearly twice as great on the drained as on the undrained land. On the drained land there was a large increase from all the different treatments except the limestone, which seems not to have been of any advantage to the corn in 1915, and not of sufficient advantage in the 4-year average to justify its use, in so far as the corn crop alone is concerned.

TABLE XXXIII.—Fertilizers, manure and lime on CORN, Clermont County Experiment Farm

Plot	Treatment per acre	1915				4-year average*				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	
	Rotation I: Corn-soybeans-wheat-clover. Drained land. Block C									
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	27.71	2,000	.....	.....	20.64	1,275	.....	.....	1
2	Acid phosphate, 200 lb	41.43	2,050	13.53	150	25.53	1,372	5.32	126	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	42.71	2,350	14.61	550	27.43	1,550	7.64	332	3
4	None	28.29	1,700	.....	.....	19.36	1,190	.....	.....	4
5	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb	45.71	2,150	18.28	483	31.68	1,537	12.40	347	5
6	Acid phos , 200 lb.; mur. potash, 50 lb.; nit. soda, 50 lb,; powdered limestone, 2 tons	47.00	2,200	20.43	567	32.53	1,582	13.34	392	6
7	None	25.71	1,600	.....	.....	19.10	1,190	.....	.....	7
8	Phosphated manure, 8 tons	68.43	3,250	42.48	1,533	39.39	1,885	21.19	683	8
9	Phosphated manure, 8 tons; powdered limestone, 2 tons	62.00	3,950	35.81	2,117	39.46	2,162	22.16	949	9
10	None	26.43	1,950	.....	.....	16.39	1,225	.....	.....	10
	Average unfertilized yield	27.04	1,812	....	.....	18.87	1,220	.....	.....	
	Rotation I: Corn-soybeans wheat-clover. Undrained land. Block G									
1	None	34.57	2,800	.....	.....	26.93	1,775	.....	.....	1
2	Acid phosphate, 200 lb	29.71	1,700	— 2.10	—933	24.50	1,325	—1.12	—375	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	26.00	1,800	— 3.05	—667	23.07	1,400	—1.24	—225	3
4	None	26.29	2,300	.....	.....	23.00	1,550	.....	.....	4
5	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb	24.00	1,700	— 3.62	—700	20.57	1,325	—1.86	—250	5
6	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nit. soda, 50 lb.; powdered limestone, 2 tons.	35.43	2,200	6 47	—300	26.64	1,500	4.78	—100	6
7	None	30.29	2,600	.....	.....	21.29	1,625	.....	.....	7
8	Phosphated manure, 8 tons	34.00	1,700	7.62	- 533	27.07	1,400	8.16	— 66	8
9	Phosphated manure, 8 tons; powdered limestone, 2 tons	33.71	1,800	11.23	— 67	26.92	1,475	10.40	166	9
10	None	18.57	1,500	.....	.....	14.14	1,150	....	.....	10
	Average unfertilized yield	27.43	2,300	.....	.....	21.34	1,525	.....	.....	

*2-year average on undrained land.

TABLE XXXIV.—Fertilizers, manure and lime on SOYBEANS, Clermont County Experiment Farm

Plot	Treatment per acre	1915				2-year average*				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Rotation I: Corn–soybeans–wheat–clover. Drained land. Block B.									
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	5.33	710	.....	.....	4.75	1,030	.....	.....	1
2	Acid phosphate, 100 lb	7.33	1,110	.94	250	6.16	1,355	.83	236	2
3	Acid phosphate, 100 lb.; muriate potash, 20 lb	9.00	1,160	1.56	150	7.33	1,310	1.41	103	3
4	None	8.50	1,160	.....	.....	6.50	1,295	.....	.....	4
5	Acid phosphate, 100 lb.; muriate potash, 20 lb.; nitrate soda, 30 lb.	10.83	1,630	2.16	393	8.00	1,610	1.46	290	5
6	Acid phosphate, 100 lb.; muriate potash, 20 lb.; nitrate soda, 30 lb.	11.00	1,930	2.17	617	8.25	1,850	1.70	505	6
7	None	9.00	1,390	.....	.....	6.58	1,370	.....	.....	7
8	Phosphated manure on corn	12.50	2,230	4.00	837	8.91	1,955	2.61	565	8
9	Phosphated manure and powdered limestone on corn	12.50	1,520	4.50	123	9.08	1,690	3.05	280	9
10	None	7.50	1,400	.....	.....	5.75	1,430	.....	.....	10
	Average unfertilized yield	7.58	1,165	.....	.....	.....	.....	.....	.....	
	Rotation I: Corn–soybeans–wheat–clover. Undrained land. Block H									
1	None	6.33	1,820	.....	.....	.....	.....	.....	.....	1
2	Acid phosphate, 100 lb	7.00	1,580	—1.78	—427	.....	.....	.....	.....	2
3	Acid phosphate, 100 lb; muriate potash, 20 lb	11.00	2,140	— .22	— 53	.....	.....	.....	.....	3
4	None	13.67	2,380	.....	.....	.....	.....	.....	.....	4
5	Acid phosphate, 100 lb.; muriate potash, 20 lb.; nitrate soda, 30 lb	17.33	2,160	3.44	13	.....	.....	.....	.....	5
6	Acid phosphate, 100 lb.; muriate potash, 20 lb.; nitrate soda, 30 lb.	17.00	2,040	2.89	127	.....	.....	.....	.....	6
7	None	14.33	1,680	.....	.....	.....	.....	.....	.....	7
8	Phosphated manure on corn	18.33	2,500	5.00	740	.....	.....	.....	.....	8
9	Phosphated manure and powdered limestone on corn	19.33	2,640	7.00	800	.....	.....	.....	.....	9
10	None	11.33	1,920	.....	.....	.....	.....	.....	.....	10
	Average unfertilized yield	11.42	1,950	.....	.....	.....	.....	.....	.....	

*Yields on undrained land for 1915 only.

TABLE XXXV.—Fertilizers and manure on WHEAT, Clermont County Experiment Farm

Plot	Treatment per acre	1915				3-year average				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Rotation I: Corn-soybeans-wheat-clover. Drained land. Block A									
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	18.17	2,060	.....	.....	9.11	1,013	.....	.....	1
2	Acid phosphate, 200 lb.	17.33	2,510	.22	370	12.44	1,390	3.44	320	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb.	19.17	2,350	3.11	130	13.72	1,410	4.83	283	3
4	None	15.00	2,300	.....	.....	8.78	1,183	.....	.....	4
5	Acid phosphate, 200 lb.; muriate potash, 20 lb.; nitrate soda, 80 lb.	24.17	3,500	9.78	1,447	17.94	2,267	9.11	1,156	5
6	Acid phosphate, 200 lb.; muriate potash, 20 lb.; nitrate soda, 80 lb.*	28.33	3,200	14.55	1,393	19.22	2,150	10.33	1,111	6
7	None	13.17	1,560	.....	.....	8.95	967	.....	.....	7
8	Acid phosphate 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.	22.50	2,750	11.50	1,427	16.11	1,920	8.15	1,030	8
9	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.*	29.67	3,420	20.83	2,333	19.17	2,167	12.18	1,353	9
10	None	6.67	850	.....	.....	6.00	737	.....	.....	10
	Average unfertilized yield	13.25	1,692	.....	.....	8.54	975	.....	.....	
	Rotation I: Corn-soybeans-wheat-clover. Undrained land. Block E									
1	None	5.67	960	.....	.....	.....	.....	.....	.....	1
2	Acid phosphate, 200 lb.	22.67	2,000	15.33	840	.....	.....	.....	.....	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb.	25.00	3,540	16.00	2,180	.....	.....	.....	.....	3
4	None	10.67	1,560	.....	.....	.....	.....	.....	.....	4
5	Acid phosphate, 200 lb.; muriate potash, 20 lb.; nitrate soda, 80 lb.	23.33	1,500	12.99	—113	.....	.....	.....	.....	5
6	Acid phosphate, 100 lb.; muriate potash, 20 lb.; nitrate soda, 80 lb.*	23.00	3,520	13.00	1,853	.....	.....	.....	.....	6
7	None	9 67	1,720	.....	.....	.....	.....	.....	.....	7
8	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.	16.67	2,600	4.77	340	.....	.....	.....	.....	8
9	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.*	18.67	2,700	4.33	—100	.....	.....	.....	.....	9
10	None	16.67	3,340	.....	.....	.....	.....	.....	.....	10
	Average unfertilized yield	10.67	1,895	.....	.....	.....	.....	.....	.....	

*Powdered limestone on corn.

If we value 16 percent acid phosphate at $15 per ton, muriate of potash at $50 and nitrate of soda at $60, prices at which they might have been purchased, freight paid to average points in Ohio, before the European War and prices which will probably be restored when the war ends, the treatment which the corn crop has received would have cost $1.50 per acre for Plot 2, $2.75 for Plot 3 and $4.35 for Plot 5. With corn at 50 cents per bushel the 4-year average gain on Plot 2 has been worth $2.66; that on Plot 3, $3.82; and that on Plot 5, $6.20—leaving a net balance of $1.16 on Plot 2, $1.07 on Plot 3, and $1.95 on Plot 5. The cost of the fertilizers has therefore

Fig. 4.—Effect of phosphated manure and lime on corn, Clermont County Experiment Farm.

been recovered at once and with a profit of 30 to 75 percent for less than a year's use of the money invested in them.

Most farmers consider manure an incidental product, the cost of which is merely the labor of handling it and spreading on the field. On this basis an expenditure of $6.40 in the phosphated manure, $4.00 for the manure and $2.40 for the acid phosphate used in reinforcing it (40 pounds to the ton of manure), has brought an average total return of $10.59 annually for the 4 years, or a net return of $4.19.

Fertilizers and manure on soybeans.—The soybean crops have not yet been successfully handled on this farm. Unfavorable

weather at the time of harvesting has caused considerable loss of beans by shelling and in 1914 the beans were not threshed. Table XXXIV gives the weights obtained in 1915 and the average for 1913 and 1915, but it does not show the yield which would have been obtained had all the crop been secured.

Through an unfortunate error the crop of 1914 was incorrectly reported in Bulletin 286.

With larger experience in handling the crop there is no reason to doubt that soybeans will be successfully and profitably grown throughout southern Ohio.

Fig. 5.—Effect of fertilizers on wheat, Clermont County Experiment Farm.

Fertilizers and manure on wheat.—The wheat crops have made an immediate and large response to the fertilizers. Each of the three fertilizing materials, acid phosphate, muriate of potash and nitrate of soda, has increased the yield, as has also limestone, but the nitrate of soda seems to have had the greatest effect. In the rotation of corn, soybeans, wheat and clover the complete dressing of fertilizers and limestone has brought up the yield to 28 bushels per acre in 1915, and the phosphated manure, fertilizers and limestone have raised it to 29 bushels, while these treatments have maintained a 3-year average of 19 bushels, as against an unfertilized average of 8½ bushels.

TABLE XXXVI.—Residual effect on CLOVER of fertilizers and manure applied to previous crops, Clermont County Experiment Farm

Rotation I: Corn–soybeans–wheat–clover. Block D

Plot	Treatment per acre for preceding crops	1915*		2-year average		Plot
		Yield per acre	Increase per acre	Yield per acre	Increase per acre	
		Lb.	Lb.	Lb.	Lb.	
1	None	4,000		2,120		1
2	Acid phosphate, 500 lb	5,000	1,000	2,726	608	2
3	Acid phosphate, 500 lb.; muriate potash, 90 lb	4,400	400	2,618	501	3
4	None	4,000		2,115		4
5	Acid phosphate, 500 lb.; muriate potash, 90 lb.; nitrate soda, 160 lb	5,300	1,333	3,059	920	5
6	Acid phos., 500 lb.; mur. potash, 90 lb.; nit. soda, 160 lb.; powdered limestone, 2 tons	5,400	1,467	3,033	871	6
7	None	3,900		2,185		7
8	Phosphated manure, 8 tons; acid phos., 200 lb.; mur. potash, 50 lb.; nit. soda, 50 lb	6,800	2,550	4,115	1,770	8
9	Phosphated manure, 8 tons; acid phos., 200 lb.; mur. potash, 50 lb.; nit. soda, 50 lb.; powdered limestone, 2 tons	7,500	2,900	4,385	1,879	9
10	None	4,950		2,666		10
	Average unfertilized yield	4 212		2 271		

*Soybeans were substituted for clover in 1915.

TABLE XXXVII.—Fertilizers and manure on crops grown in rotation, Clermont County Experiment Farm. Total value of increase, cost of treatment and net gain per acre for entire rotation

Rotation I: Corn-soybeans-wheat-clover. Drained land

Plot	Treatment per acre as applied to crops preceding clover	Average increase per acre							Total value of increase	Total cost of fertilizer	Net gain per acre	Plot
		Corn		Soybeans		Wheat		Clover				
		Grain	Stover	Grain	Straw	Grain	Straw					
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Lb.	Dollars	Dollars	Dollars	
1	None											1
2	Acid phosphate, 500 lb	5.32	126	.94	250	3.44	320	608	9.91	3.50	6.41	2
3	Acid phosphate, 500 lb.; muriate potash, 90 lb	7.64	332	1.56	150	4.83	283	501	11.42	5.75	5.67	3
4	None											4
5	Acid phosphate, 500 lb.; muriate potash, 90 lb.; nitrate soda, 160 lb	12.40	347	2.16	393	9.11	1,156	920	20.16	10.55	9.61	5
6	Acid phos., 500 lb.; mur. potash, 90 lb.; nit. soda, 160 lb.; powdered limestone, 2 tons	13.34	392	2.17	617	10.33	1,111	871	21.97	16.55	5.42	6
7	None											7
8	Phosphated manure, 8 tons; acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb	21.19	683	4.00	837	8.15	1,030	1,770	28.97	10.40	18.57	8
9	Phosphated manure, 8 tons; acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.; powdered limestone, 2 tons	22.16	949	4.50	123	12.18	1,353	1,879	33.52	16.40	17.12	9
10	None											10
	Average unfertilized yield											

Residual effect of fertilizers, lime and manure on clover.—Table XXXVI shows that each of the treatments have been followed by a considerable increase in the clover crops. The increase from manure has been about twice as great as that from the fertilizers, but no decided effect is yet apparent from the addition of ground limestone to either manure or fertilizers.

Total outcome.—Table XXXVII shows that the total increase found in the four crops of this first rotation has been sufficient to pay the cost of the treatment with a considerable margin to spare. Each addition to the fertilizer has increased the total gain. The net gain from phosphorus and potassium combined has not been quite as great as that from phosphorus alone; but when nitrogen has been added in nitrate of soda the gain has been much more than sufficient to offset the largely increased cost of the fertilizer.

In this table corn is computed at 40 cents a bushel, soybeans at $1, wheat at 80 cents, hay at $10 a ton, stover at $2.50 and straw at $2; acid phosphate at $14 a ton, muriate of potash at $50, nitrate of soda at $60, ground limestone at $3 and manure at 50 cents. The manure was reinforced with 40 pounds of acid phosphate per ton of manure.

If manure is computed at 50 cents a ton, the profit from its use has been gerater than that from the fertilizers, but at a higher charge for manure the relative cost of the treatment would be changed.

The potatoes-wheat-clover rotation.—This rotation was started in 1914, and the results for that year and 1915 are given in Tables XXXIX and XL. It will be seen that the potato yields have been small, as is to be expected in this latitude, where only very early varieties can be successfully grown, and on this thin soil. The results are uneven, although the treatment has produced a general increase of crop.

The wheat following potatoes has confirmed the usual experience that a potato crop is one of the best preparations for wheat, the wheat yields in 1915 reaching 40 bushels per acre on the manured land.

TABLE XXXVIII.—CORN and SOYBEANS in ordinary and deep tillage test, Clermont County Experiment Farm

Rotation II: Corn, soybeans and cover crops	Yield per acre—1915		
	Corn		Soybean hay
	Grain	Stover	
	Bu.	Lb.	Lb.
Land plowed deep	31.14	2,320	3,600
Land plowed to ordinary depth	31.77	2,270	4,400

In addition to the experiments reported in previous bulletins a 2-year rotation has been started, the object being the production of cow feed and maintenance of soil fertility. Corn is planted on one acre, to be cut for the silo. At the last cultivation of the corn, rye and vetch are sown. The next year the rye and vetch are to be plowed under and soybeans sown, the latter cut for hay and a cover crop of rye sown to be plowed under the next year for corn. The corn and soybeans are fed to cows and the manure thus produced, reinforced with acid phosphate, is returned to the acre that goes in corn each year. Half of each one of these plots was plowed with a deep tilling plow and half in the ordinary way.

TABLE XXXIX.—Fertilizers and manure on POTATOES, Clermont County Experiment Farm

Rotation III: Potatoes–wheat–clover

Plot	Treatment per acre	1914—Block P		1915—Block Q		2-year average		Plot
		Yield per acre	Increase per acre	Yield per acre	Increase per acre	Yield per acre	Increase per acre	
		Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	
1	None	48.00	.....	42.67	.....	45.33	.....	1
2	Acid phosphate, 200 lb	79.33	23.55	42.00	2.00	60.66	12.77	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	77.67	14.12	47.00	9.66	62.33	11.89	3
4	None	71.33	.....	34.67	.....	53.00	.....	4
5	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb	73.00	2.78	41.33	6.22	57.16	4.50	5
6	Acid phosphate, 400 lb.; muriate potash, 100 lb.; nitrate soda, 100 lb	73.00	3.89	55.33	19.77	64.16	11.83	6
7	None	68.00	.....	36.00	.....	52.00	.....	7
8	Barnyard manure, 8 tons	69.67	5.89	61.33	20.44	65.50	13.16	8
9	Barnyard manure, 8 tons; acid phosphate, 200 lb	107.00	47.45	57.67	11.89	82.33	29.67	9
10	None	55.33	.....	50.67	.....	53.00	.....	10
	Average unfertilized yield	60.66	.....	41.00	.....	50.83	.....	

TABLE XL.—Fertilizers and manure on WHEAT following potatoes, Clermont County Experiment Farm

Rotation III.—Potatoes–wheat–clover. Block P

Plot	Treatment per acre	Yield per acre, 1915		Increase per acre		Plot
		Grain	Straw	Grain	Straw	
		Bu.	Lb.	Bu.	Lb.	
1	None	17.67	1,580			1
2	Acid phosphate, 200 lb	29 67	3,620	8.67	1,473	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	36.33	4 120	11.99	1,407	3
4	None	27.67	3,280			4
5	Acid phosphate, 200 lb.; nitrate soda, 50 lb.; muriate potash, 50 lb	30.67	3,420	3.45	273	5
6	Acid phosphate, 400 lb.; nitrate soda, 100 lb.; muriate potash, 100 lb	36.33	4,660	9.55	1,647	6
7	None	26.33	2,880			7
8	Manure, 8 tons	40.67	5,760	15.56	3,113	8
9	Manure, 8 tons; acid phosphate, 200 lb	39.67	5,480	15.78	3,067	9
10	None	22.97	2,180			10
	Average unfertilized yield	23.58	2,480			

Record of cropping—1915

Area of farm, 130.21 acres
Acres cultivated, 88.99 acres
Permanent pasture, 13.09 acres
Woodland, 14.19 acres
Roads (farm), 7.94 acres
Miscellaneous, 6 acres

PLOT WORK	Number of plots	Total acreage	Total yield	Yield per acre
Corn	32	3.5	8443.00 lb.	34.46 bu.
Oats	10	1.0	1245.10 "	38.91 "
Wheat	53	4.3	5785.00 "	22.42 "
Soybeans	29	2.4	1319.00 "	9.16 "
Soybean hay	22	2.5	11990.00 "	2.40 "
Cowpeas	1	.1	.....	.....
Potatoes	10	.5	1406.00 "	46.86 bu.
Alfalfa	10	1.0	3911.56 "	1.96 T
Pasture	18	3.6	.....	.....
Total	185	18.9	.....	.....
FIELD WORK				
Corn	.....	7.0	210.00 bu.	30.00 bu.
Soybeans (2 acres in orchard)	.....	8.4	55.00 "	6.54 "
Wheat	.....	5.7	120.00 "	21.05 "
Mixed hay	.....	7.0	4.50 T	.64 T
Oat hay	.....	3.0	2.00 "	.66 "
Timothy hay	.....	4.0	2.75 "	.69 "
Orchard	.....	11.7	2.75 bu.	.....
Buckwheat	.....	4.0	3526.00 lb.	17.63 bu.
Potatoes	.....	1.0	9.75 bu.	9.75 "
Soybeans-disked down	.....	13.0	.....	.....
Lying idle (undrained)	.....	10.9	.....	.....
Total	.....	75.7	.....	.....

	Corn	Oats	Wheat	Soybeans
Lowest-yielding plots per acre ..... bushels..	25.7	35.9	12.5	5.3
Highest-yielding plots per acre ..... do.....	68.4	44.0	40.6	18.3

Number crop acres:
Field work.....75.69
Plot work.....18.90

Number work horses used in 1915 4
Number crop acres per work horse 23.65
Number man hours per year (from Mar. 1, 1915 to Feb. 29, 1916, inclusive) 5865.00
Number horse hours per year (from Mar. 1, 1915 to Feb. 29, 1916, inclusive) 4938.00

COMPARISONS OF VARIETIES AND CULTURAL TESTS

DEPARTMENT OF AGRONOMY

Corn.—Seven varieties of corn have been tested for two seasons, and six for three seasons. As a 3-year average, Orcutt's Reid stands highest in yield of grain, with Darke County Mammoth second and Leaming third. Orcutt's Reid has given the largest yield of stover, with Cook's 75 second, and Darke County Mammoth third.

TABLE XLI.—Comparison of varieties of CORN, Clermont County Experiment Farm

Variety	Yield of grain per acre (bushels)				3-year average yield of stover per acre (pounds)
	1915	1914	1913	3-year average	
Leaming	34.13	34.62	29.83	32.86	1,483
Clarage	30.51	35.90	28.71	31.71	1,440
White Cap	28.75	26.23	29.69	28.22	1,433
Cook's 75	29.32	37.47	28.02	31.60	1,560
Reid (Orcutt)	35.32	40.72	29.30	35.11	1,820
Leaming-Cuppy	.....	37.88	28.11	*32.99	*1,395
Darke County Mammoth	35.75	33.85	31.74	33.78	1,533

*2-year average.

Oats.—The variety oats test includes seven varieties for 2 years and six varieties for 1 year. The yields in 1915 are more than double what they were in 1913 and 1914.

As a 3-year average, the Big Four stands highest in yield, with the Silvermine second and the Ohio 6203 third.

TABLE XLII.—Comparison of varieties of OATS, Clermont County Experiment Farm

Variety	Yield of grain per acre (bushels)				3-year average yield of straw per acre (pounds)
	1915	1914	1913	3-year average	
Big Four	43.35	16.87	16.48	25.57	1,710
Silvermine	36.90	16.98	15.13	23.00	933
Swedish Select	41.48	10.84	4.61	18.98	1,247
Ohio 7009 (Sixty Day)	36.43	23.43	.....	*29.93	*910
Ohio 6203 (Siberian)	44.55	12.18	9.40	22.04	1,430
Ohio 6222 (Improved American)	39.12	6.87	10.96	18.98	1,027
Wideawake	36.69	16.25	12.11	21.68	1,721

*2-year average.

Wheat.—Different varieties of wheat have been tested but 2 years. The Portage leads in yield, with the Nigger second and Mediterranean third.

TABLE XLIII.—Comparison of varieties of WHEAT, Clermont County Experiment Farm

Variety	Yield of grain per acre (bushels)			2-year average yield of straw per acre (pounds)
	1915	1914	2-year average	
Nigger	23.28	13.74	18.51	2,100
Mediterranean	20.61	14.92	17.76	2,195
Rudy	15.88	14.42	15.15	1,805
Turkey Red	11.83	8.47	10.15	1,480
Gladden (Ohio 6100)	21.39	13.57	17.48	2,185
Portage (Ohio 6400)	18.66	19.53	19.09	1,860
Velvet Chaff	18.67	13.58	16.12	1,808

A date of seeding test was conducted in 1914. A uniform rate of seeding was used, and all the conditions of the test were as nearly uniform as could be made. The seeding made October 6 gave the largest yield, with October 13 second and September 29 third in yield.

TABLE XLIV.—Date of seeding WHEAT, Clermont County Experiment Farm

Date of seeding, 1914	Yield per acre	
	Grain	Straw
	Bushels	Pounds
September 8	16.00	1,740
September 15	22.50	2,550
September 22	13.17	1,260
September 29	28.33	2,600
October 6	34.17	2,950
October 13	32.17	2,670
October 28	15.83	1,310
November 3	16.33	1,570

Table XLV shows the results of a rate of seeding test in which rates ranging from 4 to 8 pecks per acre were used. The largest yield of grain and straw was obtained with 7 pecks per acre.

Further tests will be required as to both date and rate before certain answers can be made to these questions, though they give the best information we have at the present time for this county.

TABLE XLV.—Rate of seeding WHEAT, Clermont County Experiment Farm

Rate per acre (pecks)	Yield per acre	
	Grain	Straw
	Bushels	Pounds
Four	29.83	2,510
Five	32.83	2,930
Six	31.50	2,810
Seven	37.50	3,350
Eight	32.33	2,960

Soybeans.—A variety test of soybeans was conducted in 1915. The yields were exceptionally low, as is often the case with the first crop on thin land. The Mongol gave the largest yield, with the Medium Green second and the Ohio 9035 third.

TABLE XLVI.—Comparison of varieties of SOYBEANS, Clermont County Experiment Farm

Variety	Yield per acre (1915)	
	Grain	Straw
	Bushels	Pounds
Chestnut	5.95	1,750
Mongol	7.62	1,570
Ebony	6.23	1,550
Ohio 9100	2.78	1,790
Ohio 9035	6.84	2,150
Medium Green	7.12	2,092
New Era cowpeas (hay)		950

DEPTH OF PLOWING TEST

A depth of plowing test has been started in which 5-inch plowing, as done with the ordinary plow, is being compared with 13-inch plowing, as done with the Spalding plow. One crop of corn has been grown and one of soybeans. It is too early for any positive conclusions to be drawn, though the first indications are that very deep plowing of this soil will not pay.

TABLE XLVII.—Comparison of depths of plowing, Clermont County Experiment Farm

Depth of plowing (inches)	Yield per acre		Yield of hay per acre
	Corn		
	Grain	Stover	Soybeans
	Bushels	Pounds	Pounds
Five	31.77	2,270	4,400
Thirteen	31.14	2,320	3,600

THE HAMILTON COUNTY EXPERIMENT FARM

FOURTH ANNUAL REPORT, FOR THE YEAR 1915

D. R. VAN ATTA, AGENT IN CHARGE
A. W. HUSTON, FARM FOREMAN

PERSONNEL

D. R. Van Atta assumed the duties of county agricultural agent for Hamilton County, January 1, 1915, and since that date the county experiment farm has been under his supervision.

FARM IMPROVEMENTS AND ADDITIONS TO EQUIPMENT

D. R. VAN ATTA

Dairy barn.—The enlarging and remodeling of the barn on the west end of the farm to convert it into a dairy barn has been completed, and the dairy stock has been increased to 12 cows.

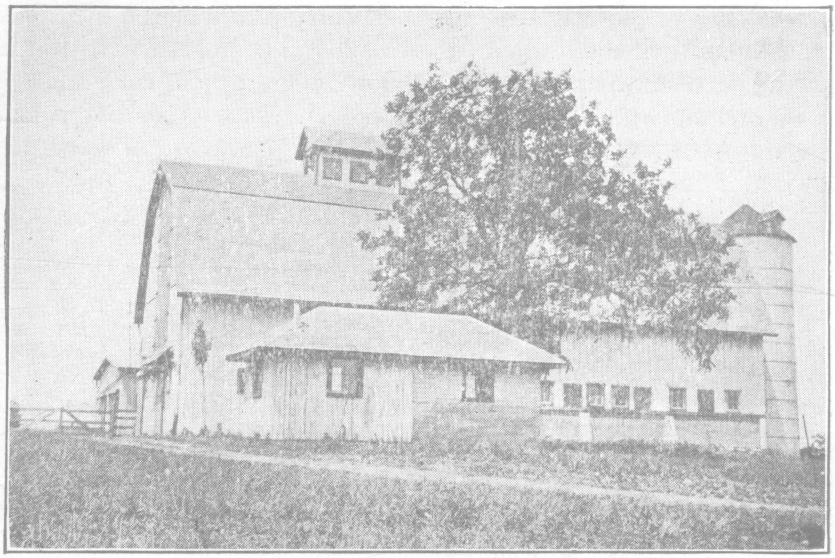


Fig. 6.—Dairy barn, Hamilton County Experiment Farm.

Fig. 7.—Horse barn, Hamilton County Experiment Farm.

A milk house, 10 by 12 by 8 feet was built in the fall and winter of 1914, the lower half being built of concrete, the upper half being shingled on the outside and ceiled on the inside with beaded ceiling. This house was found to be too small to contain the equipment required, and a frame structure of the same size has been added, this addition being made to contain engine, pump and heater. Diagram VIII shows the arrangement of the several items of equipment shown below:

Simplex No. 7 separator
24-bottle hand Babcock tester
2½ H. P. Foos. Jr. engine and pump combined
1 galvanized wash tank 2 by 3 feet
1 20-gallon feed cooker used as a water heater for wash water
1 table for airing water heater
1 cupboard
2 dozen ½-pint milk bottles
4 milk pails
3 5-gallon milk cans
1 10-gallon milk can

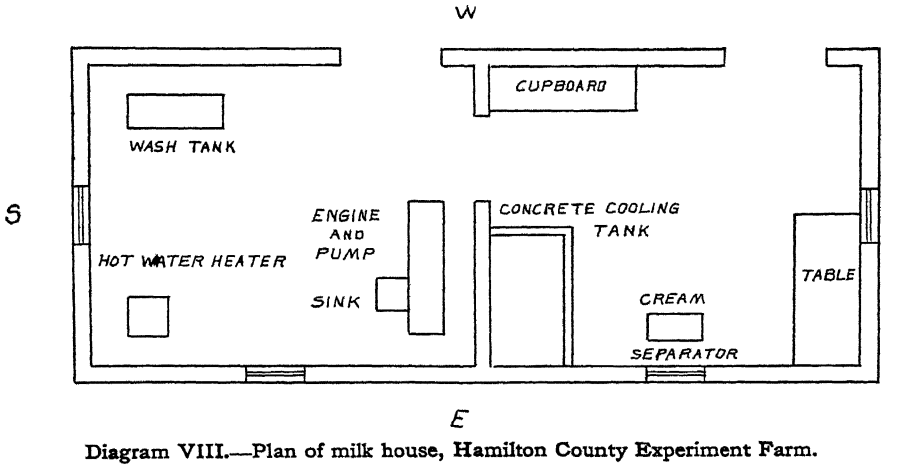


Diagram VIII.—Plan of milk house, Hamilton County Experiment Farm.

The orchards, planted in the fall of 1912 and spring of 1913, contain 55 varieties of apples, 28 of pears and 19 of plums. An additional orchard of 210 apple trees was planted in order to study cultural methods.

GENERAL WORK

C. W. MONTGOMERY

Field crops.—The field rotation so far has been corn, soybeans, wheat, clover. Up to date the field that goes to soybeans has been divided and half sown to oats and half to soybeans with a view of determining which crop is the more profitable and its influence on

the succeeding crop. While the crops have not been weighed and definite conclusions cannot be drawn, it would seem that the wheat following oats has been better than that following soybeans, but the soybeans have only in part made growth sufficient to be worth harvesting; and the second time around may show entirely different results, and soybeans, as a rule, do much better the second time on the land.

Seed corn.—A special feature is made of supplying good seed grown on the farm to the farmers of the county. Mr. Huston, the foreman, this year selected corn from the stalk before cutting and at husking time. This corn was stored on racks in a mouse-proof, airy place and will be tested for germination before being sent out.

Pastures.—How best to increase the carrying capacity of pasture land is an important problem for some farms. For the solution of this problem a number of plots were laid out just north of the residence house, in the spring of 1914, and treated as shown by Diagram IX. The early part of the season was unfavorable for the growth of new grass, and the plowed and seeded plots were disked and reseeded in midsummer. A good stand from this midsummer seeding was obtained. In the spring of 1915 the pasture plots were again fertilized as shown by the diagram.

FIRST SERIES

1	Check
2	Plowed; 2400 lb. lime, 280 lb. 4–10–5 fertilizer; seeded
3	Disked; 2400 lb: lime, 280 lb. 4–10–5 fertilizer; seeded
4	Check
5	225 lb. 16 percent acid phosphate
6	225 lb. 16 percent acid phosphate, 25 lb. muriate potash
7	275 lb. 4–10–5 fertilizer

SECOND SERIES

9	275 lb. 4–10–5 fertilizer
8	2400 lb. lime
7	225 lb. 16 percent acid phosphate, 25. lb. muriate potash
6	225 lb. 16 percent acid phosphate
5	Check
4	Disked; 2400 lb. lime, 280 lb. 4–10–5 fertilizer
3	Plowed; 2400 lb. lime, 280 lb. 4–10–5 fertilizer; seeded
2	8 tons manure, 225 lb. 16 percent acid phosphate, 2400 lb. lime
1	Check

Diagram IX.—Plan of fertilization in pasture experiments, Hamilton County Experiment Farm

HAMILTON COUNTY EXPERIMENT FARM

Mt. Healthy, Ohio

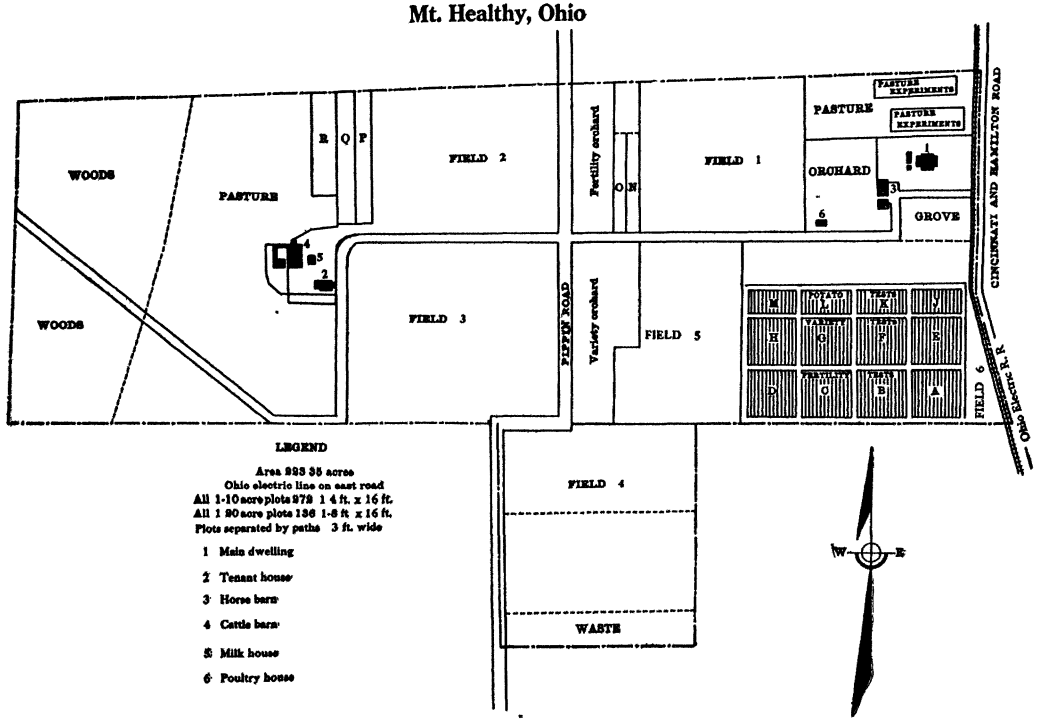


Diagram X.—Plan of Hamilton County Experiment Farm

To determine the value of clipping pastures the plots are clipped in June and August each year, while the adjacent land is left unclipped.

The pasture field west of the barn was grubbed and briers were cut during August.

Truck crops.—In the original plan for the work on the Hamilton County Experiment Farm it was stated that 7,700 acres in Hamilton County were in truck crops (not including market garden crops) producing an estimated value of $290,000. A canvass among the growers of these truck crops reveals the fact that manure can no longer be obtained in plenty and at low cost as it could years ago. However, the necessity for organic matter in the soil, for crops that require much cultivation, is much more evident than years ago, so that if manure is not available some other method must be resorted to.

It is planned to take two blocks of land, one to be called the manure block and one, the cover crop block. These blocks will be divided into plots. The manure block is to be treated with 10 tons of manure per acre annually, and the different plots are to be treated with different kinds and amounts of fertilizing elements and lime. The cover crop block is to be treated with the same fertilizing elements as the manure block. The same crops are to be grown each year on the two blocks. On the cover crop block some cover crop will be sown at the last cultivation of the truck crop to be plowed under the next year. The object of this experiment is, first, to compare the production of truck crops by the use of cover crops and with manure; second, to learn whether it will pay and to what extent to add fertilizers to both cover crops and manure.

COST OF GROUND LIMESTONE

In cooperation with the manufacturers of a portable-limestone crusher, a demonstration was given on the farm of preparing limestone for distribution on the land. Limestone outcrops in the ravine on the west end of the farm, and the cost of collecting and grinding this with a portable crusher as compared with shipping in the ground stone is shown below:

By purchasing:

Ground limestone—51.35 tons at $1 (f. o. b. Columbus)	$ 51.35
Freight—Columbus to Mt. Healthy, 51.35 tons at $1.15	59.05
Hauling—Mt. Healthy to Experiment Farm, man and team, 14 days at $4	56.00
Total cost	$166.40
Cost per ton	3.24

By crushing on the Farm:

Collecting limestone—8¾ man hours at 20c	$ 1.75
Hauling (21 tons rock), man hours—31¼ at 20c	6.25
horse hours—62½ at 10c	6.25
Labor—(3 men to work at crusher) 42 man hours at 15c	6.30
Engine hire—14 hours at 70c	9.80
Charge for crusher (estimated)	7.50
Coal—1100 pounds at $3.75 per ton	2.06
Total cost	$ 39.91
Cost per ton	1.90

Fig. 8.—Crushing limestone, Hamilton County Experiment Farm.

EXPERIMENTS IN THE MAINTENANCE OF SOIL FERTILITY

DEPARTMENT OF SOILS

Two rotations are in progress on this farm; namely:

Rotation I: Corn, soybeans, wheat, clover.
Rotation II: Potatoes, wheat, clover.

The plan of fertilizing in these rotations is shown in Tables XLVIII and LIV.

TABLE XLVIII.—Plan of fertilizing in corn-soybeans-wheat-clover rotation, Hamilton County Experiment Farm

Plot	Treatment	Total cost per acre	Pounds per acre on		
			Corn	Soybeans	Wheat
1	None				
2	Acid phosphate	$ 3.75	200	100	200
3	Acid phosphate Muriate potash	6.00	200 50	100 20	200 20
4	None				
5	Acid phosphate Muriate potash Nitrate soda	10.00	200 50 50	100 20 30	200 20 80
6	Yard manure, untreated		5 tons		5 tons
7	None				
8	Shed manure, untreated		5 tons		5 tons
9	Shed manure, phosphated		5 tons		5 tons
10	None				
11	Shed manure, phosphated Ground limestone		5 tons 2 tons		5 tons
12	Shed manure, phosphated Ground limestone Acid phosphate Muriate potash Nitrate soda		5 tons 2 tons		200 50 50
13	None				

Note: The fertilizers, including the nitrate of soda, to be applied just before planting the crop. The manure to be plowed under for corn, but applied as a top dressing for wheat. The "phosphated" manure to be treated with 40 pounds of acid phosphate per ton of manure, the phosphate to be mixed with the manure before spreading.

FERTILIZERS AND MANURE ON CROPS GROWN IN ROTATION

ROTATION I: CORN-SOYBEANS-WHEAT-CLOVER

Table XLIX shows that the corn crops, which have thus far been the first crops to receive treatment in this experiment, have shown a comparatively small effect from the fertilizers. Manure seems to have been more effective on corn than fertilizers, especially in 1915.

The soybeans (Table L) have made small yields, as usually occurs when this crop is grown for the first time, and there has been but little increase from the treatment.

The wheat yields for 1915 (Table LI) were satisfactory on the fertilized and manured land, reaching an average of 36 bushels per acre on the two plots on which both wheat and corn receive phosphated manure, as against an average unfertilized yield of less than 12 bushels.

The clover (Table LII) made nearly 1¾ tons of hay per acre on the unfertilized land, and nearly 2 tons more than this amount on the manured land. The smaller quantity of manure and the lodging of the crop may account for the smaller yield on Plot 12.

TABLE XLIX.—Fertilizers and manure on CORN, Hamilton County Experiment Farm

Rotation I: Corn–soybeans–wheat–clover. Block B

Plot	Treatment per acre	1915				3-year average				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	44.29	2,900	.....	.....	42.69	3,312	.....	.....	1
2	Acid phosphate, 200 lb	41.43	2,700	— .48	— 133	46.74	3,312	3.68	31	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	41.43	2,700	1.91	— 67	52.71	3,010	9.29	240	3
4	None	37.14	2,700	.....	.....	43.79	3,218	.....	.....	4
5	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb	45.71	3,100	7.62	367	50.12	3,225	6.13	99	5
6	Yard manure, untreated, 5 tons	57.14	3,100	18.09	333	50.50	3,382	6.30	348	6
7	None	40.00	2,800	.....	.....	44.40	2,942	.....	.....	7
8	Shed manure, untreated, 5 tons	65.71	3,400	29.52	500	58.52	3,453	14.53	561	8
9	Shed manure, phosphated, 5 tons	*	3,600	.....	600	†54.25	3,285	†5.04	442	9
10	None	28.57	3,100	.....	.....	43.19	2,793	.....	.....	10
11	Shed manure, phosphated, 5 tons.; ground limestone, 2 tons	45.71	4,000	14.76	1,033	47.26	3,525	5.47	818	11
12	Shed manure, phosphated, 5 tons.; ground limestone, 2 tons	75.71	3,600	42.38	767	57.14	3,450	16.71	830	12
13	None	35.71	2,700	.....	.....	39.05	2,533	.....	.....	13
	Average unfertilized yield	37.14	2,840	.....	.....	42.62	2,960	.....	.....	

*Record lost. †2-year average.

TABLE L.—Fertilizers on SOYBEANS, Hamilton County Experiment Farm

Plot	Fertilizers per acre on soybeans	1915				2-year average				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Rotation I: Corn-soybeans-wheat-clover. Block A									
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	9.50	1,580	.....	.....	7.62	1,327	.....	.....	1
2	Acid phosphate, 100 lb	11.17	1,430	1.00	—93	8.17	1,210	— .08	— 26	2
3	Acid phosphate, 100 lb.; muriate potash, 20 lb	11.83	1,890	1.00	423	8.83	1,420	— .04	274	3
4	None	11.50	1,410	.....	.....	9.50	1,055	.....	.....	4
5	Acid phosphate, 100 lb.; muriate potash, 20 lb.; nitrate soda, 30 lb	11.33	1,920	— .17	360	10.20	1,262	.55	150	5
6	*	12.83	1,730	1.33	20	10.20	1,137	.40	— 32	6
7	None	11.50	1,860	.....	.....	9.96	1,227	.....	.....	7
8	*	13.87	2,080	2.81	243	10.85	1,355	1.19	125	8
9	*	15.83	2,350	5.22	537	11.70	1,422	2.35	192	9
10	None	10.17	1,790	.....	.....	9.04	1,232	.....	.....	10
11	*	16.83	2,190	7.11	390	12.16	1,370	3.23	181	11
12	*	12.00	2,180	2.72	370	9.83	1,435	1.01	289	12
13	None	8.83	1,820	.....	.....	8.70	1,102	.....	.....	13
	Average unfertilized yield	10.30	1,692	.....	.....	8.96	1,189	.....	.....	

*Plots 6, 8, 9, 11 and 12 receive no fertilizer or manure on soybeans; for treatment on corn and wheat see Tables XLIX and LI.

TABLE LI.—Fertilizers and manure on WHEAT, Hamilton County Experiment Farm

Rotation I: Corn-soybeans-wheat-clover. Block D

Plot	Treatment per acre	1915				2-year average				Plot
		Yield per acre		Increase per acre		Yield per acre		Increase per acre		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	
1	None	12.50	1,450	.....	.....	12.87	1,527	.....	.....	1
2	Acid phosphate, 200 lb	27.83	2,680	16.27	1,340	24.58	2,250	11.08	710	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb	27.17	2,570	16.56	1,340	26.17	2,417	12.04	865	3
4	None	9.67	1,120	.....	.....	14.75	1,565	.....	.....	4
5	Acid phosphate, 200 lb.; muriate potash, 20 lb.; nitrate soda, 80 lb.	29.67	2,820	19.72	1,417	26.92	2,672	11.40	870	5
6	Yard manure, untreated, 5 tons	22.83	3,080	12.61	1,393	22.00	2,655	5.72	615	6
7	None	10.50	1,970	.....	.....	17.04	2,277	.....	.....	7
8	Shed manure, untreated, 5 tons	26.67	3,600	15.11	1,560	22.87	2,877	6.70	747	8
9	Shed manure, phosphated, 5 tons	36.83	4,190	24.22	2,080	28.83	3,232	13.54	1,250	9
10	None	13.67	2,180	.....	.....	14.42	1,835	.....	.....	10
11	Shed manure, phosphated, 5 tons; ground limestone, 2 tons	35.33	3,780	22.27	1,797	29.25	3,295	15.31	1,564	11
12	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb.	33.00	3,520	20.56	1,733	28.46	2,992	15 02	1,365	12
13	None	11.83	1,590	.....	.....	12.95	1,522	.....	.....	13
	Average unfertilized yield	11.63	1,662	.....	.....	14.40	1,745	.....	.....	

TABLE LII.—Residual effect on CLOVER of fertilizers and manure applied to previous crops, Hamilton County Experiment Farm

Rotation I.—Corn-soybeans-wheat-clover. Block C

Plot	Treatment per acre Fertilizing materials applied to previous crops	Yield per acre	Increase per acre	Plot
		Lb.	Lb.	
1	None	3,027		1
2	Acid phosphate, 500 lb	3,373	260	2
3	Acid phosphate, 500 lb.; muriate potash, 90 lb	3,805	605	3
4	None	3,286		4
5	Acid phosphate, 500 lb.; muriate potash, 90; nitrate soda, 160 lb	4,411	1,082	5
6	Yard manure, untreated, 10 tons	5,016	1,640	6
7	None	3,416		7
8	Shed manure, untreated, 10 tons	5,665	2,206	8
9	Shed manure, phosphated, 10 tons	4,584	1,081	9
10	None	3,546		10
11	Shed manure, phosphated, 10 tons; ground limestone, 2 tons	*5,449	1,903	11
12	Shed manure, phosphated, 5 tons; ground limestone, 2 tons; acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb	*3,805	259	12
13	None	3,546		13
	Average unfertilized yield	3,364		

*Plots 11 and 12 were badly lodged.

The financial outcome.—It is too early as yet to attempt to formulate definite conclusions as to the effect of the different treatments in this experiment. The crops have not all come under the complete plan of treatment, and experience has shown that the full effect of a fertilizer or manure is practically never realized in the crop to which it is applied; but it is interesting to compare the results as they now stand at the end of the first rotation, although it is certain that these results will be considerably modified as the work goes on. This comparison is made in Table LIII. In this table the cost of fertilizing materials is computed at rates prevailing

Fig. 9.—Effect of phosphated manure and lime on corn, Hamilton County Experiment Farm.

before the European War and which will probably be restored when the war ends; corn is rated at 40 cents a bushel, wheat at 80 cents, soybeans at $1, hay at $8 per ton, corn stover at $3, and straw at $2.50—prices low enough to cover the cost of harvesting the extra crop produced by the treatment.

Table LIII shows that acid phosphate, when used alone, has returned its cost with a liberal margin. Muriate of potash, when added to the phosphate, has increased the total and net yields, but there has thus far been no further increase from nitrate of soda.

TABLE LIII.—Financial outcome of experiments with fertilizers and manure, Hamilton County Experiment Farm, first 4-year period

Rotation I: Corn–soybeans–wheat–clover.

Plot	Total fertilizers for one 4-year rotation					Total cost of treatment*		Total valueo increase	Net gain or loss(−)		Plot
	Acid phosphate	Muriate potash	Nitrate soda	Manure	Limestone	Manure at 50 cents	Manure at $2		Manure at 50 cents	Manure at $2	
	Lb.	Lb.	Lb.	Tons	Tons	Dollars	Dollars	Dollars	Dollars	Dollars	
2	500	.....	.....	.....	.....	3.75	.....	12.03	8.28	.....	2
3	500	90	.....	.....	.....	6.00	.....	17.13	11.13	.....	3
5	500	90	160	.....	.....	10.80	.....	17.62	6.82	.....	5
6	.....	.....	.....	10	.....	5.00	20.00	15.11	10.11	−4.89	6
8	.....	.....	.....	10	.....	5.00	20.00	22.90	17.90	2 90	8
9	400	.....	.....	10	.....	8.00	23.00	22.00	14.00	−1.00	9
11	400	.....	.....	10	2	14.00	29.00	28.25	14.25	− .75	11
12	200	50	50	5	2	9.75	17.25	23.64	13.89	6.39	12

*14 percent acid phosphate computed at $15 per ton, muriate potash at 2½ cents per pound, nitrate soda at 3 cents per pound and ground limestone at $3 00 per ton, all spread on the land. Before the European War these prices would have covered the necessary cost of fertilizing materials if purchased in carloads. Manure is computed at 50 cents and $2 per ton. While manure is regarded as an incidental product the lower price will cover the cost of hauling out and spreading on the average farm. If it is purchased and hauled some distance its cost may equal or exceed the higher price.

Ten tons of yard manure, when rated at 50 cents a ton, has given nearly as large a net gain as the combination of acid phosphate and muriate of potash, and shed manure has shown a much larger effect. The reinforcement of shed manure with acid phosphate does not seem to have increased its effectiveness, but the further addition of ground limestone appears to have increased the yield by an amount sufficient to cover the cost of the limestone.

When manure is rated at $2 a ton, the net gain disappears in three cases out of five, thus indicating that if the cost of manure, laid on the land, reaches this amount, it is better to use chemical fertilizers.

THE POTATOES-WHEAT-CLOVER ROTATION

Because of the large amount of drainage required on this farm it was not practicable to get the land drained for the potatoes-wheat-clover rotation until 1913. In 1914 potatoes were grown on Block K and in 1915 on Block L, and wheat followed on K in 1915. Wheat was also grown on Block M without fertilizers in 1915. Only 10 of the 13 plots have thus far been brought under experiment. The results of this experiment for 1914 and 1915 are shown in Tables LV and LVI.

TABLE LIV.—Plan of fertilizing in potatoes-wheat-clover rotation, Hamilton County Experiment Farm.

Plot	On Potatoes				On Wheat			
	Acid phosphate	Muriate of potash	Nitrate of soda	Manure	Acid phosphate	Muriate of potash	Nitrate of soda	Manure
	Lb.	Lb.	Lb.	Tons	Lb.	Lb.	Lb.	Tons
1								
2	200				200			
3	200	50			200	50		
4								
5	200	50	50		200	50	50	
6	400	100	100		400	100	100	
7								
8				8				8
9	200			8	200			8
10								
11	200	50		8	200	50		8
12	200			8				
13								

TABLE LV.—Fertilizers and manure on POTATOES, in potatoes-wheat-clover rotation, Hamilton County Experiment Farm

Plot	Treatment per acre	Yield per acre				Plot
		1914 Block K	1915 Block L	2-year average		
				Yield	Increase	
		Bu.	Bu.	Bu.	Bu.	
1	None	150.83	203.33	177.08	....	1
2	Acid phosphate, 200 lb	133.00	143.33	138.16	−17.00	2
3	Acid phosphate, 200 lb; muriate potash, 50 lb	137.33	146.67	142.00	8.75	3
4	None	122.67	100.00	111.33	....	4
5	Acid phosphate, 200 lb; muriate potash, 50 lb.; nitrate soda, 50 lb	141.83	150.00	145.91	29.33	5
6	Acid phosphate, 400 lb.; muriate potash, 100 lb.; nitrate soda, 100 lb	138.83	206.67	172.75	50.91	6
7	None	132.50	121.67	127.08	....	7
8	Manure, 8 tons	166.83	196.67	181.75	47.55	8
9	Manure, 8 tons; acid phosphate, 200 lb	158.83	260.00	209.41	68.11	9
10	None	128.50	168.33	148.41	....	10
	Average unfertilized yield	133.62	148.33	140.97	....	

TABLE LVI.—Fertilizers and manure on WHEAT, in potatoes-wheat-clover rotation, Hamilton County Experiment Farm

Plot	Treatment per acre	1915—Block K				Plot
		Yield per acre		Increase per acre		
		Grain	Straw	Grain	Straw	
		Bu.	Lb.	Bu.	Lb.	
1	None	27.33	3,560			1
2	Acid phosphate, 200 lb	32.67	4,440	6.67	1,067	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	43.67	5,680	19.01	2,493	3
4	None	23.33	3,000			4
5	Acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb	40.33	5,880	15.78	2,653	5
6	Acid phosphate, 400 lb.; muriate potash, 100 lb.; nitrate soda, 100 lb	43.00	5,820	17.22	2,367	6
7	None	27.00	3,680			7
8	Manure, 8 tons	41.33	6,120	15.33	2,680	8
9	Manure, 8 tons; acid phosphate, 200 lb	40.00	6,680	15.00	3,480	9
10	None	24.00	2,960			10
	Average unfertilized yield	25.66	4,873			

The potato yields have been too irregular to justify any conclusions further than that the complete fertilizer and the manure have apparently caused a material increase of crop. By comparing Plot 2 with the unfertilized plots between which it lies it would seem that acid phosphate used alone has been a detriment to the crop; but it will be observed that the yields of Plot 1 have been much higher than those of any other unfertilized plot, and that those of Plot 2, while considerably under the yields of Plot 1, are higher than those of Plot 4. Because of these irregularities it will be well to harvest another crop before attempting to draw any conclusions from this experiment.

The wheat yields are much more regular and consistent than those of potatoes, and the increase is large enough to pay for the cost of the fertilizers for the entire rotation, at ordinary prices for fertilizers and $1 a bushel for wheat, so that whatever gain the potatoes have made is clear profit.

COMPARISONS OF VARIETIES AND CULTURAL TESTS

DEPARTMENT OF AGRONOMY

Corn.—The yields of corn averaged higher in 1915 than in either of the previous seasons' tests, Clarage yielding highest, with Cook's 75 second and Darke County Mammoth third. The same varieties lead in the 3-year average, though in different order. Cook's 75 is first; Darke County Mammoth, second; and Clarage, third. It will be noted that the yields of the 3 highest are within a bushel of each other.

TABLE LVII.—Comparison of varieties of CORN, Hamilton County Experiment Farm

Variety	Yield of grain per acre (bushels)				3-year average yield of stover per acre (pounds)
	1915	1914	1913	3-year average	
Leaming	65.40	54.95	48.99	56.45	2,342
Clarage (local)	70.22	57.00	52.53	59.92	2,825
White Cap	61.84	43.49	51.42	52.25	2,115
Cook's 75	67.36	57.52	57.60	60.83	2,611
Reid (Orcutt)	62.35	61.79	52.13	58.72	2,805
Ohio 84	56.97	48.03	42.03	49.01	1,871
Clarage (Northern)	63.74	53.40	46.60	54.58	2,031
Leaming—Cuppy	.....	67 68	51.84	*59.76	*2,227
Darke County Mammoth	65.88	61.26	53.18	60.11	2,641

*2-year average.

Oats.—Seven varieties of oats, one each of barley and emmer have been grown 3 years in succession. The crop of 1915 was much superior to either of the others, the seven varieties averaging more

than 61 bushels per acre. As a 3-year average, the Silvermine stands first; the Big Four, second; and Ohio 6222, third. The average yield of the oats is 40 percent greater than the yield of Oderbrucker barley, allowing for the different weight per bushel, and more than 61 percent greater than emmer.

TABLE LVIII.—Comparison of varieties of OATS, Hamilton County Experiment Farm

Variety	Yield of grain per acre (bushels)				3-year average yield of straw per acre (pounds)
	1915	1914	1913	3-year average	
Big Four	64.40	46.21	17.93	42.85	2,083
Silvermine	65.23	42.88	21.51	43.21	2,233
Swedish Select	65.02	27.82	8.02	33.62	2,160
Ohio 7009 (Sixty Day)	65.65	25.54	16.92	36.04	1,920
Ohio 6203 (Siberian)	55.54	25.81	11.34	30.90	1,905
Ohio 6222 (Improved American)	61.80	36.99	11.93	36.91	2,063
Wideawake	54.82	38.09	16.09	36.33	2,199
Oderbrucker barley	29.38	14.38	8.96	17.57	1,337
Emmer	38.44	23.44	6.87	22.92	2,150

Wheat.—Two years' tests have been conducted with nine varieties of wheat. As an average of the two tests, the Red Wave is highest in yield; the Portage, second; and the Nigger, third.

TABLE LIX.—Comparison of varieties of WHEAT, Hamilton County Experiment Farm

Variety	Yield of grain per acre (bushels)			2-year average yield of straw per acre (pounds)
	1915	1914	2-year average	
Nigger	25.89	27.41	26.65	2,802
Gladden (6100)	28.62	22.35	25.48	2,742
Mediterranean	25.29	22.14	23.71	2,650
Red Wave	27.57	28.47	28.02	2,697
Turkey Red	25.56	22.35	23.95	2,565
Ohio 8106 (Fultz)	26.05	26.57	26.31	2,520
Portage (6400)	25.23	28.85	27.04	2,255
Goens	20.45	23.57	22.01	2,470
Velvet Chaff	25.67	22.80	24.23	3,010

A date of seeding test was conducted in 1914-1915. The largest yield was secured from the seeding made September 22, but this seeding leads that made October 13 by only 1.16 bushels, which would seem to indicate that early October seeding is pretty safe in this county.

The rate of seeding test reported in the same table is in favor of 5 pecks per acre. The yields from the various rates are not consistent. More reliable information will be available in a few years.

TABLE LX.—Date and rate of seeding WHEAT, Hamilton County Experiment Farm

Date of seeding	Yield per acre	Rate of seeding per acre	Yield per acre
	Bushels	Pecks	Bushels
September 8	23.83	4	15.00
September 15	20.17	5	27.83
September 22	27.33	6	24.17
September 29	16.67	7	27.67
October 6	25.83	8	21.67
October 13	26.17	.....	.....
October 27	4.67	.....	.....

Soybeans.—Eight varieties of soybeans and one of cowpeas have been tested for three seasons. As a result of the 3-year average, the Ebony stands first in yield; the Mongol, second; and the Ohio 7496, third. The average yield of all the varieties for the 3-year period is 15.1 bushels per acre, or more than three times the yield of the New Era cowpeas.

TABLE LXI.—Comparison of varieties of SOYBEANS, Hamilton County Experiment Farm

Variety	Yield of grain per acre (bushels)				3-year average yield of straw per acre (pounds)
	1915	1914	1913	3-year average	
Mongol	18.41	12.28	19.46	16.72	2,673
Ebony	22.41	12.25	16.51	17.06	2,378
Chestnut	21.19	11.61	10.34	14.38	1,963
Ohio 9100	15.22	11.34	15.35	13.97	1,800
Ohio 9016	19.52	*5.51	15.13	13.39	2,435
Ohio 7496	22.85	11.56	15.29	16.57	2,841
Ohio 9035	14.68	14.17	19.30	16.05	2,301
Medium Green	16.30	7.92	13.90	12.71	2,234
New Era cowpeas	1.00	7.08	5.33	4.47	2,498

*A poor stand.

DAIRYING

DEPARTMENT OF DAIRYING

The following is in brief the present plan for work with the dairy on the Hamilton County Experiment Farm.

The Jersey breed has been selected for the dairy on this farm. Grade cows have been purchased and are to be bred to a purebred Jersey bull. The object is to build up a small herd of excellent producers by the careful selection of males and the raising of heifers from good cows only. The cows will be tested in the local test association and poor producers will be discarded.

In all selections large size is to be second only in importance to production. Large animals with large production is the aim.

Careful data are to be kept showing the cost of producing such a herd and the cost of the product from the herd.

Where one has but a small tract of land, the ordinary 3- and 4-year rotations of crops do not fit in with dairying to the best advantage. Some crops are grown in these rotations not adapted, or not best adapted to feeding cows. It is desirable to grow crops producing the maximum amount of food material. This seems to be possible with corn, alfalfa and soybeans, all of which seem well adapted to Hamilton County. The maximum materials can be grown in corn and alfalfa where the latter does well. A part of the plan is to attempt to practice a two-crop rotation of corn and alfalfa, each of these crops to be grown on the same piece of land for 4 to 5 years, then the order to be reversed; that is, corn will be grown on the alfalfa land and alfalfa on the corn land.

These plots are to be fertilized by applying cow manure reinforced by phosphate to the corn plot. The corn is to go into the silo and the alfalfa to be cured as hay. Necessary grains to supplement these feeds are to be purchased.

Another two-crop rotation of corn and soybeans is planned, the crops to be grown alternately and used in the same manner as the corn and alfalfa. When possible rye may be used as a cover crop between these crops and plowed under to provide humus.

Feeding.—It is planned to test the possibilities of milk production with silage and alfalfa hay only and with silage and soybean hay only. These rations with varying quantities of grain added should be compared. Some soiling crop work may be done.

Product.—At present the milk will be separated, the cream sold as sweet cream and the skimmilk used to feed calves and pigs.

THE WASHINGTON COUNTY EXPERIMENT FARM

SECOND ANNUAL REPORT, FOR THE YEAR 1915

ERNEST J. RIGGS, AGENT IN CHARGE
C. B. HARVEY, FARM FOREMAN

THE WORK OF THE YEAR

ERNEST J. RIGGS

FARM IMPROVEMENTS

The farm improvements made since the purchase of the farm have included the remodeling of the barn; the erection of a corncrib and wagon shed and wagon scale; the building of 128 rods of fence, and the laying of 985½ rods of tile drain, all on the Fleming farm; and the erection of a small greenhouse on the truck farm.

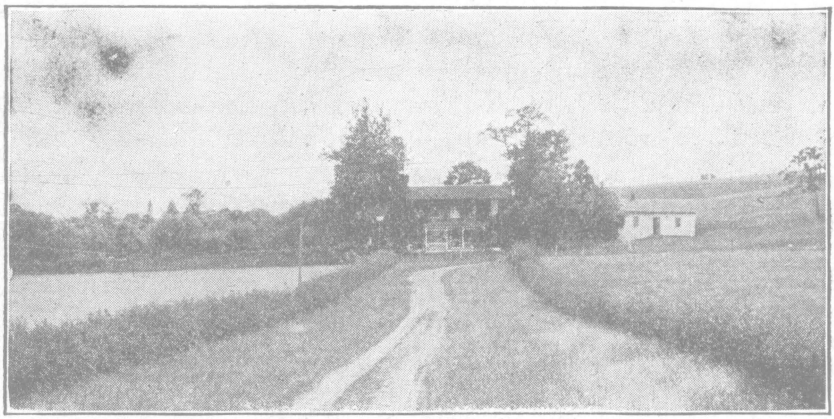


Fig. 10.—Residence, Washington County Experiment Farm.

GENERAL FARM CROPS

In many respects the season of 1915 was exceptional. After an unusually dry March and April, during which time it was difficult to prepare proper seed beds, heavy rains fell which hardened the ground and delayed the seeding for at least a week beyond the normal time of seeding. Heavy rains continued to fall throughout the growing season, making it difficult to cultivate the crops as they should have been cultivated, and the harvesting was done under great difficulty on account of the continuous rains.

Because of the limited amount of funds available for the purchase of teams and equipment, it was necessary to limit the farm crops to those which required the least possible amount of labor.

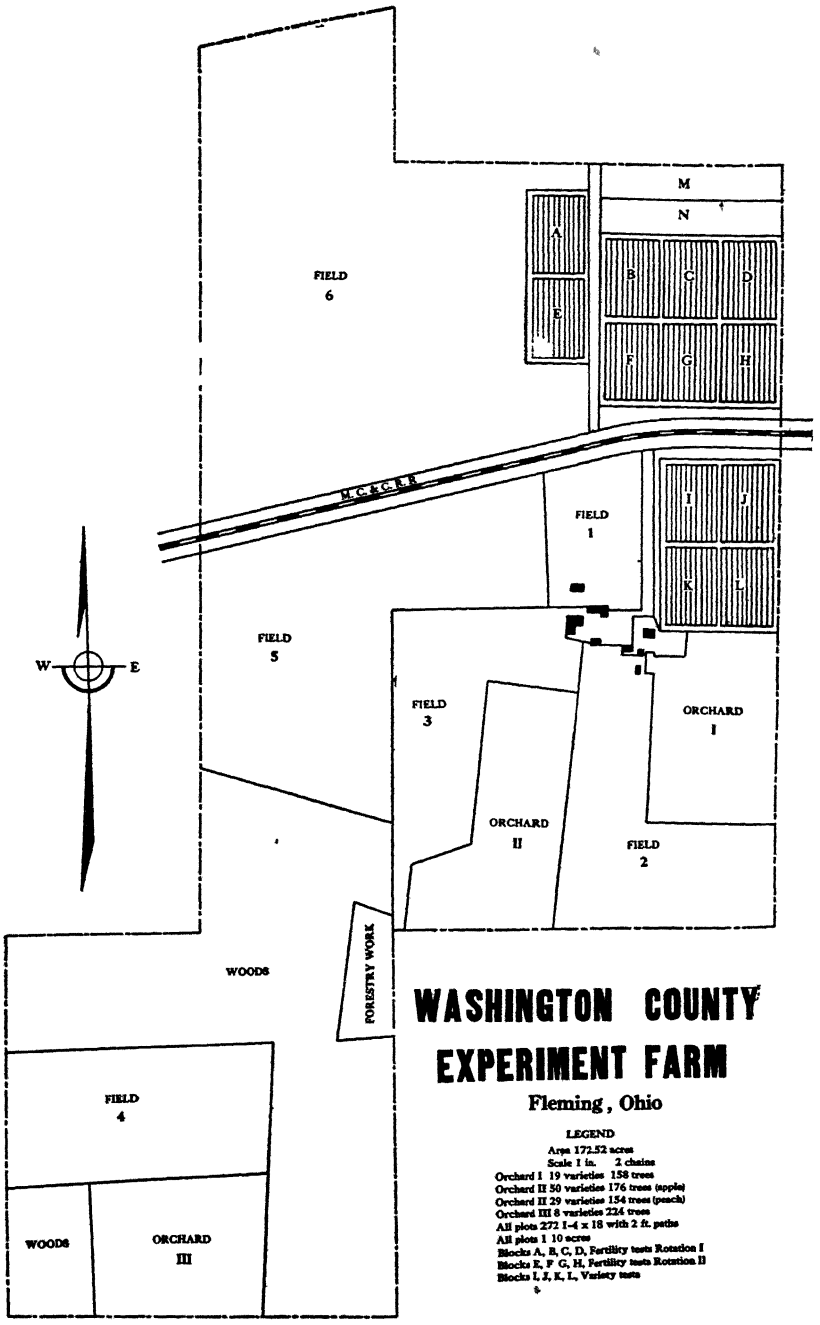


Diagram XI.—Plan of Washington County Experiment Farm.

On the north side of the railroad, a piece of ground about one acre in extent, which was rather low and somewhat wet, was sown to Canada field peas and oats. On account of the extremely dry April the grain was slow in germinating, and the extremely wet weather which followed seemed to prevent the proper growth and maturity of this crop. As a result, only 1½ ton of field-cured hay was secured. This hay was used largely for the late summer feeding of the work horses.

Adjoining the field of peas and oats, another acre of ground was devoted to the production of Johnson County White corn, the object being to produce on this ground some high-grade seed corn which could be distributed in small quantities among the farmers of Washington County. The wet weather, however, prevented the proper maturing of this corn, and it was thought best not to offer it for seed purposes without giving it unusual attention, which we were not in a position to do. Seed corn for our own use from this plot was selected while the corn was still standing in the field, care being taken to select only those ears which showed uniformity of maturity and uniform height upon the stalk. From the 200 ears or more selected in this way, about 50 ears will be finally selected and used for seed in 1916.

In a far corner in this same field was another plot of ground of about 1 acre in extent which was used for ear-row test work. Several ears were selected from each of four different varieties, as follows: Reid's Yellow Dent, Johnson County White, Boone County White, and a local corn of no particular variety, which was furnished us by a successful corn grower of the Muskingum Valley, which we have called the Engle corn, named after the man who furnished the seed. The variation in the yields of the various ears which entered this test was unusually great, ranging from 14.08 bushels produced by an ear of Reid's Yellow Dent to 90.5 bushels produced by an ear of the Engle corn.

It is the plan to plant side by side the remnants of the two highest-yielding ears of each variety in 1916. The plots of ground for this work will be located on such portions of the farm that there will be no cross-pollination from other varieties of corn. From the crop produced by the several pairs of ears will be selected other ears for ear-row test work the following season. By a continuation of this method it is hoped that higher-yielding strains of corn will be produced. When a sufficient amount of corn has been obtained

which has proved satisfactory in yield, the farmers of the county will be given an opportunity to purchase limited quantities of this seed for use upon their own farms.

The following tables give in detail the record of this test:

TABLE LXII.—Two highest-yielding ears in ear-row test of varieties indicated
(One row each of 52 hills)

Row	Variety	Yield per row	Yield per acre
		Pounds	Pounds
52	Reid's Yellow Dent (Scarf)	55.0	3762.0
55	Reid's Yellow Dent (Scarf)	49.5	3385.8
58	Reid's Yellow Dent (Hutchinson)	58.0	3967.2
30	Reid's Yellow Dent (Hutchinson)	57.0	3898.8
39	Johnson Co. White (Scarf)	69.0	4719.6
6	Johnson Co. White (Scarf)	66.0	4514.4
48	Boone Co. White (Hutchinson)	48.0	3283.2
45	Boone Co. White (Hutchinson)	45.0	3078.0
1	Engle	90.0	6156.0
62	Engle	83.5	5711.4

TABLE LXIII.—Highest and lowest-yielding ears in ear-row test of varieties indicated
(One row each of 52 hills)

Row	Variety	Yield per row		Yield per acre
		Highest	Lowest	
		Pounds	Pounds	Pounds
58	Reid's Yellow Dent (Hutchinson)	58		3967.2
29	Reid's Yellow Dent (Hutchinson)		40.0	2736.0
39	Johnson Co. White (Scarf)	69		4719.6
41	Johnson Co. White (Scarf)		36.0	2462.4
48	Boone Co. White (Hutchinson)	48		3283.2
17	Boone Co. White (Hutchinson)		31.5	2154.6
1	Engle	90		6156.0
25	Engle		32.0	2188.8
52	Reid's Yellow Dent (Scarf)	55		3762.0
26	Reid's Yellow Dent (Scarf)		14.0	957.6

In addition to the various plots of corn already indicated, the field immediately west of the barn, consisting of 8 acres, was planted in the spring of 1915 to two different varieties, namely, the Engle corn and the Clarage. This 8-acre field produced 348 bushels of field-cured corn. After the corn was harvested this field was sown to rye, with the expectation of turning it under the following spring and seeding to soybeans, the rotation being corn, soybeans, wheat, clover.

In the fall of 1914, a 7-acre field in the extreme northern part of the farm was seeded to rye following corn, and a nearby field of 7.9 acres was also seeded to rye following soybeans. In the spring of 1915 clover seed was sown upon the 7-acre field and an excellent stand was secured. The field of 7.9 acres was seeded for the purpose of plowing under in the spring and seeding to cowpeas, but owing to the lack of help it was permitted to mature and was harvested. From these two fields the rye was harvested and threshed.

Filling ditches Outlet protection

Fig. 11.—Tiling operations, Washington County Experiment Farm.

In the spring of 1915, a 10½-acre field was seeded to soybeans with the drill, about 1¼ bushel of seed being used per acre, the object being to make this crop into hay. Nearby was another field of 10 acres on which soybeans were drilled in rows 24 inches apart, about 40 pounds of seed being used per acre, and cultivated three times during the summer. It was the intention to harvest this crop for seed. The rainy weather which prevailed during the harvest time damaged both fields of soybeans to such an extent that the cured crops were almost a complete failure.

The amount of bluegrass pasture upon the farm being very limited, a strip of ground of about 3 acres in extent, near the permanent pasture field, was sown to rape for the purpose of making a supplementary pasturage for the lambs at the time of weaning. This proved to be an exceptionally profitable supplementary feed.

Two 1-acre plots which had not yet entered the regular rotation, and 7 acres in other parts of the farm, were occupied by a timothy meadow, from which the crop was harvested, producing at the rate of about 1¼ ton per acre.

On this farm there are two apple orchards of bearing age, one of which is located near the house and consists of 120 trees about 25 years of age. From this orchard there were harvested in the fall of 1915, 129 barrels of apples, which were stored in Columbus during the winter. The expense in connection with the growing of this crop was as follows:

Labor, 383½ hours	$ 93.97
Spray material used:	
Lime-sulphur, 70 gallons at 10c	7.00
Lead arsenate, 57 pounds at 6½c	3.71
129 barrels at 32c	41.28
Total	$145.96

The other orchard, consisting of 86 bearing trees, is located in the southwestern corner of the farm, and produced 218 barrels of apples, which were also stored in Columbus during the winter. The expense in connection with the production of this crop was as below:

Labor, 359 hours	$ 79.74
Spray material used:	
Lime-sulphur, 61 gallons at 10c	6.10
Lead arsenate, 51 pounds at 6½c	3.32
218 barrels at 32c	69.76
Total	$158.92

As this section of Ohio is particularly well adapted to the production of apples, it was decided that considerable attention should be devoted to the growing of apples upon this experiment farm; consequently, one piece of ground of almost 2 acres was planted to Jonathan and Rome Beauty trees in the fall of 1914 and spring of 1915, a part of which are to be grown under the sod-mulch system, while the other part will be sown to soybeans in rows 24 inches apart and given two or three cultivations during the season. In the fall after the growth of the soybeans has ceased they will be disked into the surface of the ground and the ground seeded to rye for a cover crop during the winter. A part of the trees in each plot will receive a complete fertilizer, while another part will receive no fertilizer. Adjoining this block of trees is another piece of ground which was planted in the fall of 1914 and spring of 1915 with 53 varieties, of about two trees each, the object being to grow some of the varieties which seem to be the most promising for this section of the State. The apple trees in both of these young orchards were planted 40 feet apart each way, with a peach tree in the center of the square. As the trees increase in size and begin to need more room, the peach trees will be removed, permitting the apple trees to occupy the entire space.

During the winter of 1914 and spring of 1915 a strip of woods of poor quality was cleared and set in the spring of 1915 to 2,000 evergreen trees, consisting of 500 white pine, 500 red pine, 500 Norway spruce and 500 ponderosa pine. These trees were set in rows 5 feet apart and about 4 feet apart in the rows. It is the intention to clear out more of the worthless woods immediately joining this block which has already been set to trees, and continue the planting of evergreens.

A large portion of Washington County is and should be kept in permanent pasture, and the improvement of these pastures is a dominant question. To aid in the solution of this problem, a set of pasture plots was laid out and treated in September, 1914 and again in the spring of 1915 as shown in Diagram XII.

Plot	
1	265 lb per acre—16 percent Acid phosphate
2	265 lb per acre—0-12-4 fertilizer
3	265 lb per acre—Tankage mixture
4	2 tons per acre—Ground limestone
5	Check
6	265 lb per acre—16 percent Acid phosphate
7	265 lb per acre—0-12-4 fertilizer
8	265 lb per acre—Tankage mixture
9	2 tons per acre—Ground limestone
10	Check

Diagram XII.—Plan of pasture experiments. Plots extend south and two drill-widths wide; they are to be clipped in June and August each year.

Livestock is allowed access to this pasture field and so far no change can be noted. The future treatment of these plots will be determined from observations.

A second pasture experiment was located on one of the hilltops, where about half an acre was plowed in the spring of 1915 and fertilized with a mixture of acid phosphate and nitrate of soda, applied at the rate of 400 pounds per acre. The ground was then seeded with a mixture of seed consisting of bluegrass, timothy, redtop, orchard grass, red clover, alsike and alfalfa, and was inclosed with a fence

to prevent the stock from disturbing it. The growth was so vigorous during the summer that it was thought best to mow it in the fall and to allow the hay to form a mulch upon the ground. The plants withstood the winter well, and gave great promise of an abundance of pasture for the next season.

Record of cropping—1915

Area of farm, 172.52 acres	Waste, 3 acres
Area cultivated, 87.00 acres	Roads (farm), 2 acres
Permanent pastures, 40.00 acres	Roads (public), 3 acres
Woodland, 34.52 acres	Miscellaneous, 3 acres

PLOT WORK	Number of plots	Total acres	Total yield	Yield per acre
Corn	95	5.00	217.5 bu.	43.50 bu
Soybeans	9	.90	796.0 lb.	14.74 "
Cowpeas	1	.10	9.0 "	1.50 "
Soybean hay	20	2.25	6807.0 "	1.50 T
Alfalfa	24	2.00	1000.0 "	.50 T
Pasture	10	1.00	.....	.....
Total	159	11.25	.....	.....
FIELD WORK				
Corn	.....	8.00	348.00 bu.	43.50 bu.
Soybeans*	.....	10.00	20.00 "	2.00 "
Rye	.....	16.90	145.88 "	8.63 "
Mixed hay	.....	9.00	11.25 T	1.25 T
Soybean hay	.....	10.50	12.00 "	1.14 "
Oat and pea hay	.....	1.00	1.50 "	1.50 "
Orchard	.....	17.00	347.00 bbl.	20.40 bbl.
Rape pasture for sheep	.....	2.35	.....	.....
Sown to sweet clover for soil improvement	.....	2.00	.....	.....
Total	.....	76.75	.....	.....

	Corn	Soybeans
Lowest-yielding plots per acre.....bushels..	13.6	10.5
Highest-yielding plots per acre..... do.....	87.9	21.5

Number crop acres:
Field work.....76.75
Plot work.....11.25

Number of work horses used on Washington County (Fleming) Experiment Farm in 1915..... 3
Number crop acres per work horse..... 29.33
Number man hours per year (From Mar. 1, 1915 to Feb. 29, 1916, inclusive)..... 3099.00
Number horse hours per year (From Mar. 1, 1915 to Feb. 29, 1916, inclusive)..... 1528.25

*Spoiled by wet weather.

COMPARISON OF VARIETIES OF FIELD CROPS

DEPARTMENT OF AGRONOMY

Corn.—Two tests with different varieties of corn have been conducted. In the test of 1914 a local variety, the Fleming, led by 1.46 bushel per acre. Unfortunately this local variety was not grown in 1915. In the latter year Ohio 84 led other varieties by

0.73 bushel. Of the five varieties tested 2 years, Orcutt's Reid stands first; Darke County Mammoth, second; and the Clarage, third.

TABLE LXIV.—Comparison of varieties of CORN, Washington County Experiment Farm

Variety	Yield of grain per acre (bushels)			2-year average yield of stover per acre (pounds)
	1915	1914	2-year average	
Leaming (P. D)	52.12	30.42	41 27	3,162
Reid (Orcutt)	58.70	39.98	49.34	3,892
Cook's 75	60.45			
Fleming		41.44		
Ohio 84	61.18	27.91	44.54	3,043
Clarage	56.04	33.35	44.69	3,088
Connor's Prolific	58.85			
Darke Co. Mammoth	55 94	38.54	47.24	3,587

Soybeans.—In 1915 a test of six varieties of soybeans and one variety of cowpeas was conducted. The Ohio 9035 gave the largest yield, with the Mongol second and the Chestnut third. The New Era cowpeas gave a good yield of forage, but very few peas.

TABLE LXV.—Comparison of varieties of SOYBEANS, Washington County Experiment Farm

Variety	Yield per acre (1915)	
	Grain	Straw
	Bushels	Pounds
Mongol	18.68	6,010
Chestnut	17.73	3,730
Ebony	11.40	3,260
Ohio 9100	17.34	3,320
Ohio 9035	22.57	6,610
Medium Green	11.62	3,927
New Era cowpeas	1.50	6,310

EXPERIMENTS WITH SHEEP

DEPARTMENT OF ANIMAL HUSBANDRY

In pursuance of the plans outlined in the 1914 Report on County Experiment Farms,[1] 60 high-grade, 3-year-old Delaine Merino ewes were purchased and placed on the Washington County Experiment Farm in the autumn of 1914. Ewes of this type were selected because it was thought that they are the best adapted for Washington County conditions. The ewes were bred in the autumn of 1914 to purebred Delaine Merino rams. The ewe lambs are to be retained in the breeding flock and the wether lambs are to be kept through the winter and sold soon after they are shorn in the spring of 1916.

[1]Bul. 286, p. 280.

On many Washington County farms timothy hay and corn stover are relied upon as the principal roughages for sheep, and not sufficient legume hay is raised to make a properly balanced ration for breeding ewes and for lambs. This necessitates the purchase of some commercial nitrogenous supplement if best results are to be obtained. During the winter of 1914-15, an experiment was conducted to compare linseed oilmeal and cottonseed meal as supplemental feeds for breeding ewes. The ewes were divided into two lots of 30 each and both lots were fed alike on corn, timothy hay and corn stover. In addition to these feeds, Lot 1 was fed linseed oilmeal and Lot 2 was fed cottonseed meal.

This experiment did not show any differences of great significance between the two feeds, and it is not certain that such differences as did appear were due to the rations fed. The ewes in Lot 2, fed cottonseed meal, maintained their weight better than did those in Lot 1, fed linseed oilmeal. In wool production, there was a difference of half a pound per head in favor of the ewes fed cottonseed meal. The average yield of wool per head for Lots 1 and 2 was 9.8 pounds and 10.3 pounds, respectively. The lambs from the ewes in Lot 1 were larger at birth than were those from the ewes in Lot 2. The lambs in Lot 2, however, made more rapid growth, as they were heavier at 10 days of age and at the close of the experiment than were those in Lot 1. Since each lot was fed the same amount of feed, the cost of the two rations used in the experiment depended upon the prices of linseed and cottonseed meal. Further experimental work is necessary to determine the comparative values of linseed oilmeal and cottonseed meal as supplemental feeds for sheep.

TRUCK CROPS

W. J. GREEN AND ERNEST J. RIGGS

As the Washington County Truck Farm contains only 10 acres, and since the plots and buildings occupy about one-half of this space, there remains only about 5 acres for general farm crops.

During the season of 1915 about 3 acres of this ground was planted to sweet corn, from which was harvested and sold 307 hampers containing about 7 dozen ears each. About 1 acre was devoted to the growing of cabbage, of which only about one-half was harvested and sold for a fair price. The cabbage on the other piece of ground being somewhat later was not harvested at all, for the reason that the price for which cabbage was selling at the time this later plot was ready to harvest was so unsatisfactory that we were

not justified in placing the cabbage on the market. About 1 acre of ground was devoted to the growing of cantaloupes, squashes and peppers. Sales at a fair price were made of the peppers and squashes, but owing to the unusually wet season and the prevalence of disease on the cantaloupe vines, the fruit was unfit for market, and no sales were made.

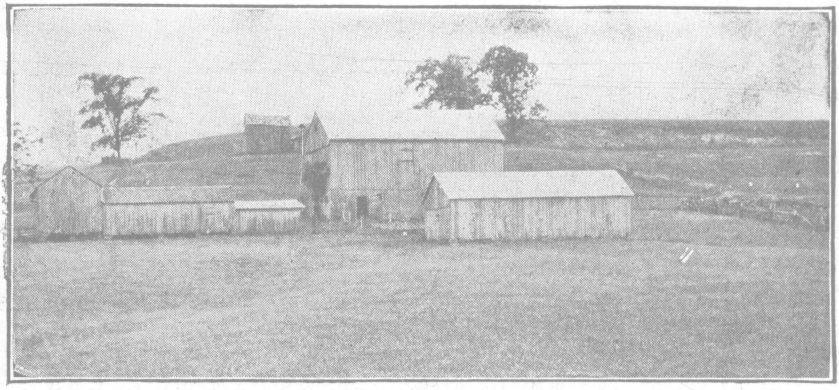


Fig. 12.—Old barn, Washington County Experiment Farm.

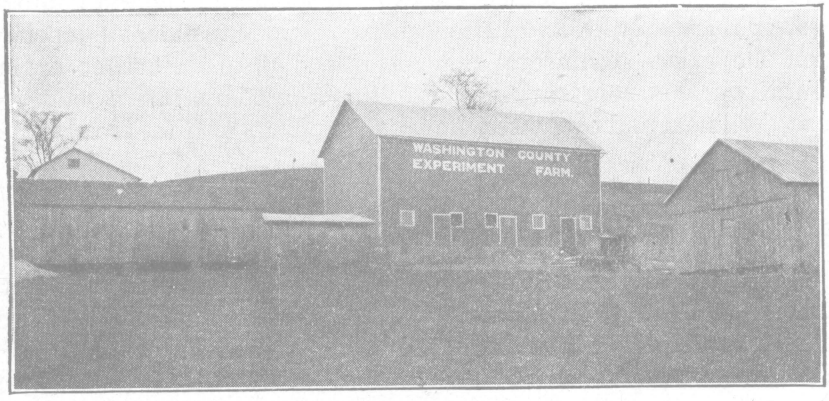


Fig. 13.—Remodeled barn, Washington County Experiment Farm.

Considerable fertilizer and stable manure has been used upon the ground not occupied by the fertility plots, in order to bring up this soil to a state of fertility corresponding to that of the farms in the immediate neighborhood, this farm being one of low fertility as compared with the farms surrounding it.

WASHINGTON COUNTY TRUCK FARM

Marietta, Ohio

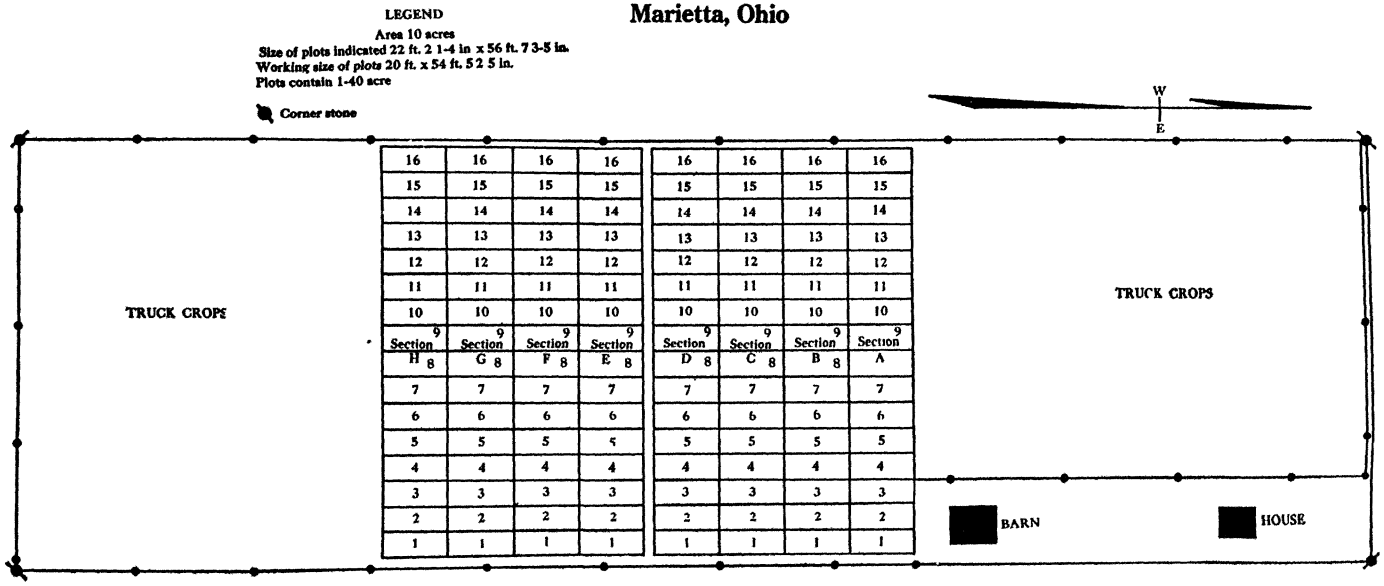


Diagram XIII.—Plan of Washington County Experiment Truck Farm.

In order that we might be better prepared for the growing of our plants, which are to be used in our variety tests and fertility work, it was found necessary to erect a greenhouse in which these plants could be grown, and through some help given by the Horticultural Department of the Experiment Station, a greenhouse, 20 by 40 feet, was constructed upon a cement foundation 2 feet in height and 6 inches in thickness. This house was made from material purchased from parties offering it at the most reasonable price, and the labor was performed entirely by the foreman and such other help as we were able to get in the community. The boiler was a second-hand one of large capacity, which we were able to purchase for less than half its original cost. A plumber was hired by the hour for

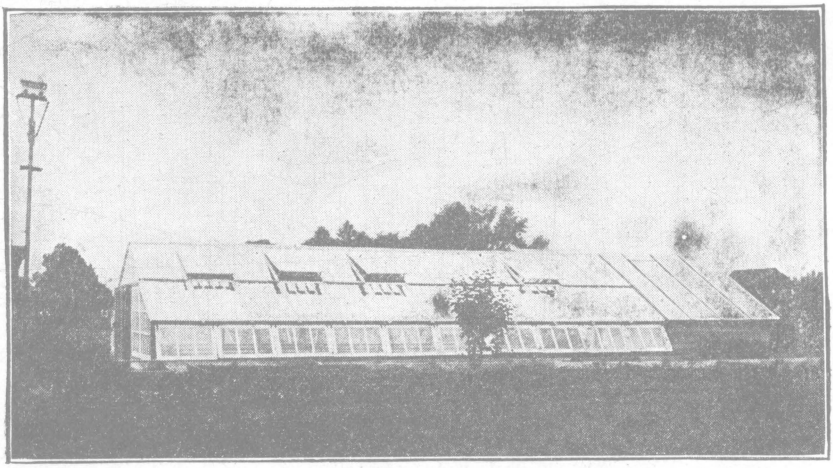


Fig. 14.—New greenhouse, Washington County Truck Experiment Farm.

the installation of this heating outfit. The entire cost of the heating plant and greenhouse, including all material and labor, except that of the foreman, was about $634. This was about $160 less than bids offered for the work by regular greenhouse contractors.

Fifty-two varieties of apple trees were planted in the fall of 1914 and spring of 1915. In addition to the varieties there was started an experiment of setting trees in sod and mulching to compare with those under cultivation. These plots are small, comprising only 72 trees. An excellent growth has been secured during both seasons since planting. The varieties have all been planted in sod and mulched.

The experiments on the truck farm consist for the most part of soil fertility work and a comparison of cover crops, reinforced with chemical fertilizers. These are styled "soil improvement plots," to distinguish from the regular soil fertility plots.

The object of the "soil improvement" work is to determine to what extent leguminous cover crops may be used to increase the fertility of the soil. Chemical fertilizers are employed with cover crops and barnyard manure.

Four blocks of 16 one-fortieth acre plots each are used in each test, so that crops of different character may be grown in rotation. The plan of treatment and the arrangement of the plots are shown in Diagram XIV, and Tables LXVI and LXVII report the yields obtained in 1915.

SOIL FERTILITY PLOTS		SOIL IMPROVEMENT PLOTS	
1	Unfertilized	1	No fertilizer. Mulched with straw Cover crop
2	Shed manure, 16 tons Acid phosphate, 400 lb.	2	Manure, 16 tons Cover crop
3	Shed manure, 16 tons	3	Manure, 16 tons Acid phosphate, 400 lb. Nitrate soda, 160 lb. Muriate, potash, 50 lb.
4	Unfertilized	4	Manure, 16 tons
5	City manure, 16 tons	5	Manure, 16 tons Ground limestone, 1 ton
6	Acid phosphate, 800 lb. Nitrate soda, 320 lb. Muriate potash, 100 lb.	6	Manure, 16 tons Acid phosphate, 400 lb. Nitrate soda, 160 lb. Ground limestone, 1 ton
7	Unfertilized	7	Manure, 16 tons
8	Acid phosphate, 400 lb. Nitrate soda, 160 lb. Muriate potash, 50 lb.	8	Manure, 16 tons Acid phosphate, 400 lb. Ground limestone, 1 ton
9	Acid phosphate, 400 lb. Nitrate soda, 160 lb.	9	Cover crop only
10	Unfertilized	10	Cover crop Acid phosphate, 400 lb. Nitrate soda, 160 lb. Muriate potash, 50 lb.
11	Acid phosphate, 400 lb.	11	Cover crop Acid phosphate, 400 lb. Nitrate soda, 160 lb. Muriate potash, 50 lb. Ground limestone, 1 ton
12	Nitrate soda, 80 lb. Sulphate ammonia, 65 lb.	12	Cover crop only
13	Unfertilized	13	Cover crop Ground limestone, 1 ton
14	Nitrate soda, 160 lb. (In 2 applications)	14	Cover crop Acid phosphate, 400 lb. Nitrate soda, 160 lb. Ground limestone, 1 ton
15	Nitrate soda, 160 lb. (In 1 application)	15	Cover crop only
16	Unfertilized	16	Cover crop Acid phosphate, 400 lb. Ground limestone, 1 ton

Diagram XIV.—Washington County Experiment Truck Farm: Plan of experiments in the use of fertilizers, manures and cover crops. Fertilizers and manures per acre. Plots one-fortieth acre

TABLE LXVI.—Experiments with fertilizers and manure on TRUCK CROPS at Washington County (Truck) Experiment Farm. Soil fertility series, 1915

Plot	Fertilizers per acre for each crop	Cost	Yield and increase per acre								Plot
			Sweet corn Section A		Cucumbers Section B		Cabbage Section C		Tomatoes Section D		
			Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	
		Dollars	Dozen	Dozen	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
1	None		787		14,940		15,960		17,180		1
2	Shed manure, 16 tons; acid phosphate, 400 lb.	3.20	713	2	18,640	+6,050	18,720	2,200	16,000	60	2
3	Shed manure, 16 tons	?	770	133	15,120	4,870	16,960	— 160	15,490	790	3
4	None		560		7,900		17,640		13,460		4
5	City manure, 16 tons	?	800	217	14,040	5,540	16,160	— 870	14,900	2,210	5
6	Acid phos., 800 lb.; nit. soda, 320 lb.; mur. potash, 100 lb.	18.50	850	243	12,580	3,480	19,160	2,750	19,130	7,200	6
7	None		630		9,700		15,800		11,160		7
8	Acid phos., 400 lb.; nit. soda, 160.; mur. potash, 50 lb.	9.75	797	186	20,060	9,810	17,960	2,330	14,690	3,510	8
9	Acid phosphate, 400 lb.; nitrate soda, 160 lb.	8.00	747	155	17,620	6,820	18,000	2,550	14,840	3,610	9
10	None		573		11,350		15,280		11,210		10
11	Acid phosphate, 400 lb.	3.20	737	102	19,680	8,510	17,400	2,250	14,460	2,650	11
12	Nitrate soda, 80 lb.; sulphate ammonia, 65 lb.	4.80	550	−148	9,620	−1,360	15,280	170	10,740	−1,660	12
13	None		760		10,800		14,880		13,000		13
14	Nitrate soda, 160 lb. (in 2 applications)	4.80	623	−133	14,240	2,050	14,840	480	8,500	−3,610	14
15	Nitrate soda, 160 lb. (in 1 application)	4.80	760	9	14,610	1,020	14,440	600	8,920	−2,310	15
16	None		747		14,980		13,320		10,340		16
	Average unfertilized yield		676		11,610		15,480		12,720		

TABLE LXVII.—Experiments with fertilizers and manure on TRUCK CROPS at Washington County Truck Experiment Farm. Soil improvement series, 1915

Plot	Fertilizer per acre for each crop	Yield and increase* per acre								Plot
		Sweet corn		Cucumbers		Cabbage		Tomatoes		
		Section E		Section F		Section G		Section H		
		Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	
		Dozen	Dozen	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	
1	None. Straw mulched. Cover crop	713	.....	4,500	.....	16,240	.....	10,000	.....	1
2	None†	673	.....	6,150	.....	17,720	.....	9,156	.....	2
3	Manure, 16 tons; acid phos., 400 lb.; nit. soda, 160 lb.; mur. potash, 50 lb.	983	210	19,340	9,970	21,960	5,300	10,910	3,330	3
4	Manure, 16 tons	767	24	15,400	6,030	18,000	1,340	9,680	2,100	4
5	Manure, 16 tons; ground limestone, 1 ton	787	44	14,860	4,890	17,520	860	9,020	1,440	5
6	Manure, 16 tons; acid phos., 400 lb.; nit. soda, 160 lb.; ground limestone, 1 ton	847	104	15,840	5,870	20,640	3,980	9,780	2,200	6
7	Manure, 16 tons	777	34	15,240	5,270	17,840	1,180	7,240	— 340	7
8	Manure, 16 tons; acid phos., 400 lb.; ground limestone, 1 ton	813	70	18,390	8,420	17,320	660	9,010	1,430	8
9	Cover crops only	773	.....	14,250	.....	17,080	.....	5,160	.....	9
10	Cover crops; acid phos., 400 lb.; nit. soda, 160 lb.; mur. potash, 50 lb	840	90	18,720	8,370	21,680	5,740	7,290	3,900	10
11	Cover crops; acid phos., 400 lb.; nit. soda, 160 lb.; mur. potash, 50 lb.; ground limestone, 1 ton	870	120	18,100	7,750	21,520	5,580	6,060	2,670	11
12	Cover crops only	763	.....	9,700	.....	16,520	.....	1,970	.....	12
13	Cover crops; ground limestone, 1 ton	797	47	11,660	1,310	18,320	2,480	2,900	— 490	13
14	Cover crops; acid phos., 400 lb.; nit. soda, 160 lb.; ground limestone, 1 ton	873	123	18,420	8,070	21,960	6,120	5,870	2,480	14
15	Cover crops only	713	.....	7,090	.....	13,920	.....	3,040	.....	15
16	Cover crops; acid phos., 400 lb.; ground limestone, 1 ton	767	17	15,020	4,670	17,680	1,840	6,320	2,930	16
	Average of Plots 2 and 9	743	.....	9,370	.....	16,660	.....	7,580	.....	
	Average of Plots 9, 12 and 15	750	.....	10,350	.....	15,840	.....	3,390	.....	

*The increase on Plots 3 to 8, inclusive, is computed on the average of Plots 1 and 9; that of Plots 10 to 16, inclusive, on the average of Plots 9, 12 and 15.

†No treatment on Plot 2 in 1915.

The crops in these experiments are to be grown in rotation.

It is too soon to attempt to draw any but the most general conclusions from this work. It is evident, however, that acid phosphate has produced a profitable increase in this first crop, but that nitrate of soda has been of doubtful if not actually negative value, especially when used alone.

The crops grown on the manured land have not been any larger than those on the land receiving chemical fertilizers. If manure is valued at $2 per ton, which would be appproximately its cost when hauled several miles, as in the case of city manure, it has been a costly fertilizer so far as this first crop is concerned. But general experience has shown that a larger part of the effect of manure is realized in crops following the one receiving the manure than is the case with chemical fertilizers.

It is of course too soon for the cover crops to have shown any effect.

THE HANCOCK COUNTY EXPERIMENT FIELD

JOHN A. SUTTON, SUPERINTENDENT
D. W. OMAN, FARM FOREMAN

In the spring of 1909 the Hancock County Agricultural Society and the Board of County Commissioners conveyed to the Experiment Station, by lease with nominal rental, a tract of 20 acres adjoining the county fairground and just outside the south corporation line of the city of Findlay, to be used for experimental purposes. This arrangement was entered into previous to the enactment of the county experiment farm law, and no provision was made by the county for equipment or current expense; hence, this tract does not come regularly under the definition of a county experiment farm, but it seems advisable to report its work in connection with that of the county experiment farms.

Work was begun in the spring of 1909, the land being then an old sod. It had been cultivated for probably 10 years previously, having originally been part of the fairground. The land was laid out in 136 plots, mostly containing one-tenth acre each, 70 of which were devoted to the testing of various combinations of fertilizing materials, 48 to the comparison of varieties of cereals and 8 to an alfalfa test.

The work in this field to the end of 1911 was reported in Bulletin 241.

THE FERTILITY TESTS

DEPARTMENT OF SOILS

Four blocks of 14 plots each are assigned to a 4-year rotation of corn, oats, wheat and clover, each crop being grown every season; and one block of the same size is given to a similar rotation in which the oat crop is replaced by soybeans. This arrangement is much less satisfactory than to have each crop growing each season because of the varying effect of different seasonal conditions, but the limited area of the land left no alternative. The fact that a similar crop is grown each season on some one of the blocks of the first rotation, will aid in drawing conclusions. Diagram XV shows the arrangement of plots in this field; Table LXVIII shows the plan of fertilizing; and Tables LXIX and LXXI give the average results to the end of 1915.

TABLE LXVIII.—Plan of fertilizing in 4-year rotation of corn, oats, wheat and clover at Hancock County Experiment Field

	On Corn				On Oats			On Wheat			
Plot	Acid phosphate	Muriate potash	Nitrate soda	Lime	Acid phosphate	Muriate potash	Nitrate soda	Acid phosphate	Muriate potash	Dried blood	Nitrate soda
1											
2	120				120			120			
3	120	20			120	20		120	20		
4											
5		20	40			20	40		20	30	60
6	120		40		120		40	120		30	60
7											
8	120	20	40		120	20	40	120	20	30	60
9	120	20	40	2000	120	20	40	120	20	30	60
10											
11	*							*			
12	*			2000	120			120			
13											
14	120	*						120	*		

* Untreated manure, 5 tons per acre.

Corn was grown in the corn-soybeans-wheat-clover rotation on Section E, in 1909 and 1913, and wheat in 1911 and 1915, and the two crops were grown on the adjoining Section B, in the corn-oats-wheat-clover rotation, the same seasons. The average yields of the unfertilized land and of that receiving fertilizers and manure for the two seasons were as below:

	Corn		Wheat	
	Sec. E	Sec. B	Sec. E	Sec. B
		Unfertilized		
1909.....bushels..	51.07	33.57	5.34	4.85
1913.....do....	34.40	25.49	7.90	4.10
		Fertilized or manured		
1909.....do....	53.67	37.81	13.18	11.39
1913.....do....	45.27	41.04	11.94	12.13

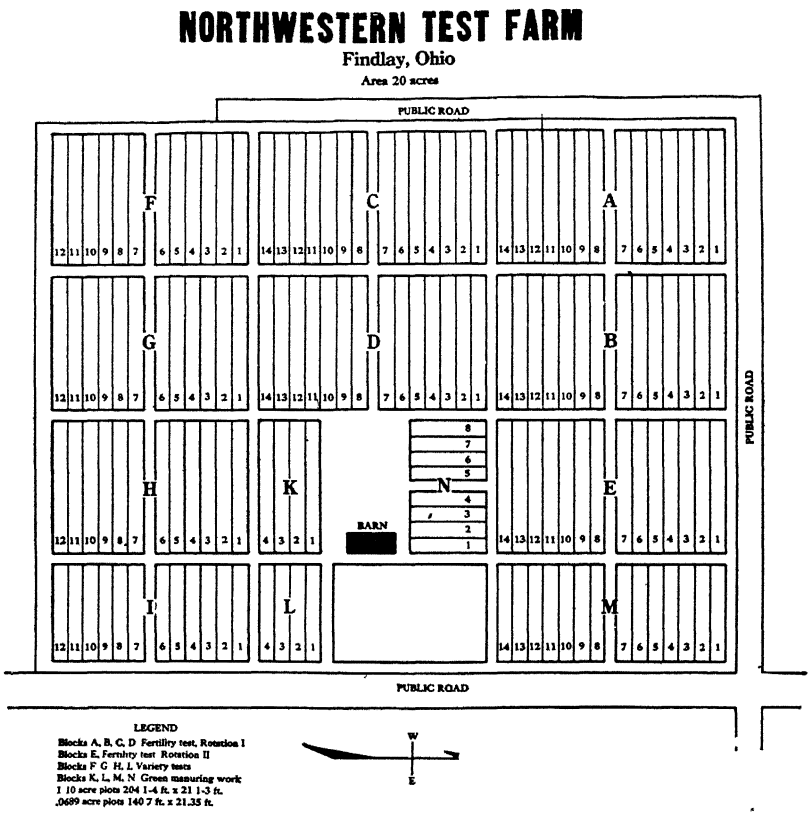


Diagram XV.—Plan of Hancock County Experiment Field.

TABLE LXIX.—Fertilizers and manure in corn-oats-wheat-clover rotation, Hancock County Experiment Field

Plot	Treatment per acre for entire rotation	Average yield per acre							Plot
		Corn—7 crops		Oats—6 crops		Wheat—5 crops		Hay—3 crops	
		Grain	Stover	Grain	Straw	Grain	Straw		
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Lb.	
1	None	26.45	1,729	28.70	1,595	5.20	672	1,300	1
2	Acid phosphate, 360 lb	32 04	2,059	33.95	1,840	10.66	1,320	1,931	2
3	Acid phosphate, 360 lb.; muriate potash, 60 lb	37.47	2,514	33.59	1,925	11.83	1,320	1,974	3
4	None	29.90	2,093	29.58	1,473	6.03	818	1,308	4
5	Muriate potash, 60 lb.; dried blood, 30 lb.; nitrate soda, 140 lb	38.82	2,564	32.71	1,767	11.03	1,444	2,415	5
	Acid phosphate, 360 lb.; dried blood, 30 lb.; nitrate soda, 140 lb	42.84	2,610	38.28	2,128	16.30	1,816	2,283	6
	None	34.55	2,319	30.94	1,577	9.33	1,140	2,023	7
	Acid phosphate, 360 lb.; muriate potash, 60 lb.; dried blood, 30 lb.; nitrate soda, 140 lb	41.33	2,677	36.72	1,935	14.46	1,812	2,439	8
	Acid phos., 360 lb.; mur. potash, 60 lb.; dried blood, 30 lb.; nit. soda, 140 lb.; lime, 1 ton	44.86	2,650	38.07	2,123	14.50	1,730	2,740	9
	None	31.75	2,203	32.29	1,498	8.07	1,016	1,507	10
	Yard manure, 10 tons	44.63	2,714	37.45	2,072	17.43	2,284	3,070	11
	Yard manure, 5 tons; acid phosphate, 240 lb.; lime, 1 ton	47.65	2,804	42.50	2,350	14.27	1,786	2,594	12
	None	36.12	2,281	33.80	1,603	6.73	878	1,463	13
	Yard manure, 10 tons; acid phosphate, 240 lb	46.20	2,667	37.97	2,077	20.40	2,216	3,907	14
	Average unfertilized yield	31.75	2,133	31.06	1,549	7.07	865	1,520	
	Average fertilized yield	41.76	2,584	36.80	2,024	14.54	1,747	2,593	

TABLE LXX.—Fertilizers and manure in corn-soybeans-wheat-clover rotation, Hancock County Experiment Field

Plot	Treatment per acre for entire rotation	Average yield per acre						Plot
		Corn—2 crops		Soybeans—1 crop	Wheat—2 crops		Clover—1 crop	
		Grain	Straw	Grain	Grain	Straw	Hay	
		Bu.	Lb.	Bu.	Bu.	Lb.	Lb.	
1	None	40.28	2,155	8.08	5.16	835	1,511	1
2	Acid phosphate, 360 lb	44.26	2,470	8.62	7.25	1,165	2,044	2
3	Acid phosphate, 360 lb.; muriate potash, 60 lb	45.26	2,530	8.46	12.50	1,195	1,911	3
4	None	38.57	2,275	8.21	6.25	875	2,222	4
5	Muriate potash, 60 lb.; dried blood, 30 lb.; nitrate soda, 140 lb	42.83	2,413	7.58	8.25	1,155	2,178	5
6	Acid phosphate, 360 lb.; dried blood, 30 lb.; nitrate soda, 140 lb	51.04	2,770	8.79	11.08	1,335	2,844	6
7	None	45.33	2,600	8.62	7.83	980	3,378	7
8	Acid phosphate, 360 lb.; muriate potash, 60 lb.; dried blood, 30 lb.; nitrate soda, 140 lb	50.89	2,702	8.29	15.92	1,720	2,933	8
9	Acid phos., 360 lb.; mur. potash, 60 lb.; dried blood, 30 lb.; nit. soda, 140 lb.; lime, 2,000 lb	50.26	2,537	8.41	15.66	1,910	3,289	9
10	None	39.88	2,452	7.20	6.16	955	2,222	10
11	Yard manure, 10 tons	50.96	2,748	9.00	10.25	1,435	3,222	11
12	Yard manure, 5 tons; acid phosphate, 240 lb.; lime, 2,000 lb	52.62	2,822	10.37	14.00	1,810	3,244	12
13	None	49.60	2,892	11.16	7.58	1,020	3,200	13
14	Yard manure, 10 tons; acid phosphate, 240 lb	57.11	3,082	11.87	18,16	1,960	3,111	14
	Average unfertilized yield	42.73	2,475	8.65	6.62	933	2,507	
	Average fertilized yield	49.47	2,675	9.04	12.56	1,520	2,642	

TABLE LXXI.—Fertilizers and manure in corn-oats-wheat-clover rotation, Hancock County Experiment Field

Plot	Treatment per acre for entire rotation	Average increase per acre								Cost of treatment	Net gain	Plot
		Corn–7 crops		Oats–6 crops		Wheat–5 crops		Hay–3 crops	Value of increase			
		Grain	Stover	Grain	Straw	Grain	Straw					
		Bu.	Lb.	Bu.	Lb.	Bu.	Lb.	Lb.	Dollars	Dollars	Dollars	
1	None											1
2	Acid phosphate, 360 lb	4.44	182	4.95	285	5.19	599	628	11.08	2.70	8.30	2
3	Acid phosphate, 360 lb.; muriate potash, 60 lb	8.72	530	4.31	411	6.08	551	669	14.08	4.20	9.88	3
4	None											4
5	Muriate potash, 60 lb.; dried blood, 30 lb.; nitrate soda, 140 lb	7.37	396	2.68	259	3.90	519	868	11.72	6.50	5.22	5
6	Acid phosphate, 360 lb.; dried blood, 30 lb.; nitrate soda, 140 lb	9.84	367	7.80	586	8.07	783	498	16.64	7.70	8.94	6
7	None											7
8	Acid phos., 360 lb.; mur. potash, 60 lb.; dried blood, 30 lb.; nit. soda, 140 lb.	7.71	397	5.33	384	5.55	714	588	13.17	9.20	3.97	8
9	Acid phos., 360 lb.; mur. pot., 60 lb.; dried blood, 30 lb.; nit. soda, 140 lb.; lime, 1 ton	12.17	409	6.23	599	6.01	672	1,061	17.67	15.20	2.47	9
10	None											10
11	Yard manure, 10 tons	11.42	485	4.65	538	9.81	1,314	1,577	22.70	10.00	12.70	11
12	Yard manure, 5 tons; acid phosphate, 240 lb.; lime, 2,000 lb	12.99	549	9.20	782	7.09	862	1,117	20.56	12.80	7.76	12
13	None											13
14	Yard manure, 10 tons; acid phosphate, 240 lb	10.08	386	4.17	473	13.66	1,338	2,444	28.43	11.80	16.63	14

The corn crop of 1909 preceded any growth of soybeans; hence, the larger yields that year on Section E must be taken as indicating natural superiority of soil.

The yields of all the crops have been unusually low throughout the entire period of this test, due in part to lack of drainage, which for want of funds was not completed until the work had been in progress for several years. The average yield of corn on the unfertilized land for the 7 years, 1909-1915, has been but 31.7 bushels per acre, while the yield for the entire county, as reported by the township assessors up to 1915 and estimated by the State Department of Agriculture for that year has been 39.9 bushels.

Hancock County contains large areas of dark, rich soil, well adapted to corn and wheat, but generally in need of drainage. Much draining has been done during recent years, but a great deal more is needed. The average yield of corn has increased from 30.7 bushels per acre for the 10 years, 1850-59, to 38.1 bushels for the 10 years, 1900-1909, and the statistics for the last 7 years indicate that the yield is still increasing. The yield of wheat has risen from 11.8 bushels for the fifties to 14.5 bushels for 1900-1909.

The livestock statistics of Hancock County show enough farm animals to produce 210,000 tons of manure during the 6 months of winter feeding, or enough to furnish 4 tons of manure for each of the 54,000 acres planted to corn. The manure used on the Experiment Field has produced an average of about 2 bushels of corn for each ton of manure. At this rate the manure produced in Hancock County, if all were applied to the corn crop, would account for 8 bushels of the average yield per acre, thus indicating that the unfertilized yield of 31.34 in the Experiment Field is probably a fair index to what the yield of Hancock County would be were no use made of manure or fertilizers.

The assessors' returns show an annual purchase of fertilizers in Hancock County for the 5 years, 1910-14, inclusive, to the amount of 2,782,141 pounds, costing $26,600, or about 92 pounds for each of the 30,000 acres sown to wheat during that period, costing 87 cents. Judging from the average price of $19 per ton, the average fertilizer has contained a little nitrogen and a little potassium. Probably a 1-8-2 or a 10-2 would approximately represent the average composition.

The 140 pounds of acid phosphate and muriate of potash used on Plot 2 in the Experiment Field has contained 17 pounds of phosphoric acid and 10 pounds of potash, thus giving it a 12-7 formula. By the addition of 60 pounds of dry swamp muck, containing 2

pounds of ammonia, this formula might have been converted into a 1-8-5, but this addition would not have materially increased the effectiveness of the fertilizer. It may safely be assumed, therefore, that the average effectiveness of the fertilizer used in Hancock County has not been greater than that of the mixture used on Plot 2, and that, therefore, not more than about 3 or 4 bushels of the average wheat yield of the county is due to the fertilizers used, thus indicating a probable unfertilized average yield of 11 or 12 bushels per acre—the actual yield during the 20 years, 1850-69, was 11.6 bushels.

This assumption would indicate that the Experiment Field, with its unfertilized yield of only 7.07 bushels per acre, represents a soil decidedly inferior for wheat to the average of the county, if it is assumed that the "farming" has been as good for wheat on this field as in the county as a whole. Whether this assumption be correct or not, the fact remains that under the same farming the yields of both corn and wheat have been increased to averages materially larger than those realized in the county as a whole, and at a cost which has been returned with dividends much larger than the usual interest rate on money.

In these Hancock County experiments the fertilizing materials have been used in very small quantities; 120 pounds per acre of acid phosphate, or 5 tons of manure, are homeopathic doses. It is interesting to compare the outcome of this application of acid phosphate with that of similar applications on the farms at Germantown and Carpenter; with the larger doses at Wooster (160 pounds on wheat) and with the still larger dose (200 pounds) on the Miami County farm, as shown in the summary table No. LXXXI. As an average of these results, 100 pounds of 14 percent acid phosphate has produced 4½ bushels of wheat, varying from 4 to 4⅓ bushels for the smaller applications and 4½ to 5 bushels for the larger ones. On the new, black land in Paulding County the response of wheat to phosphorus is doubtful, and a longer time is necessary to bring out fully the results in Clermont and Hamilton Counties. As a rule, the effect of phosphorus fertilizing increases from year to year as the treatment is repeated. Thus at Wooster the increase from acid phosphate had an average annual value of $1.70 per acre during the first 5 years as against an average annual value of $3.91 for the next 15 years; and at Strongsville the average annual value was $2.82 for the first 5 years and $3.77 for the next 10 years, the cost of the acid phosphate being 52 cents annually in each case. In view of these facts the Hancock County farmer may well consider a more liberal treatment of his fields.

COMPARISON OF VARIETIES

DEPARTMENT OF AGRONOMY

Corn.—Six varieties of corn have been tested 4 years and eight varieties for 2 years. As a 4-year average, the Leaming is slightly highest in yield; the Boone County White, second; the Darke County Mammoth and Cook's 75, third and fourth, with little difference between them. The Boone County White has a wide lead in yield of stover.

TABLE LXXII.—Variety corn test, Hancock County Experiment Field

Variety	Yield of grain per acre (bushels)					Yield of stover per acre (pounds)
	1915	1914	1912	1911	4-year average	
Darke County Mammoth	90.06	38.36	71.07	67.56	66.76	3,846
Leaming	94.66	47.46	72.26	66.78	70.29	3,783
Cook's 75	97.13	46.13	57.75	65.99	66.75	3,658
Ohio 84	84.82	45.36	64.64	67.17	65.50	3,405
Boone County White	101.96	53.22	64.68	60.42	70.07	4,623
White Cap	80.53	27.93	.....	.....	.....	.....
Medina Pride	87.20	35.21	.....	.....	.....	.....
Clarage	80.53	37.79	67.50	58.04	60.96	3,283

Oats.—Six varieties of oats have been tested for 5 years; emmer has been tested 4 years and Oderbrucker barley for 3 years. Of the oats tested the full period, Silvermine has given the highest yield; Big Four stands second; and Ohio 6203, third. Both the Oderbrucker barley and emmer have proved inferior to oats.

LXXIII.—Variety oats test, Hancock County Experiment Field

Variety	Yield of grain per acre (bushels)						5-year average yield of straw per acre (pounds)
	1915	1914	1913	1911	1910	5-year average	
Big Four	42.60	38.33	46.32	32.47	61.31	44.21	2,556
Silvermine	42.08	43.84	50.26	31.12	60.06	45.47	2,326
Swedish Select	43.85	33.95	45.56	24.03	60.27	41.53	2,178
Ohio 7009 (Sixty Day)	34.69	35.56	22.65	25.38	63.90	36.44	1,358
Ohio 6203 (Siberian)	37 50	42.60	45.67	30.18	62.97	43.78	1,946
Ohio 6222 (Imp. American)	40.31	43.01	47.34	.....	.....	*43.55	*2,527
Wideawake	41.95	36.56	41.09	24.67	55.47	39.95	2,395
Oderbrucker barley	31.64	14.58	.....	4.47	.....	*16.90	*1,233
Emmer	45.62	25.00	28.59	13.44	.....	†28.16	†2,225

*A 3-year average.
†A 4-year average.

Wheat.—Nine varieties of wheat have been tested for a period of 5 years. As a 5-year average the Dawson's Golden Chaff stands first in yield; the Mediterranean, second; the Gypsy, third; and the Fulcaster, fourth.

The Dawson's Golden Chaff has not proved to be a very satisfactory variety for bread making and is accordingly not recommended for general growing.

TABLE LXXIV.—Variety wheat test, Hancock County Experiment Field

Variety	Yield of grain per acre (bushels)						5-year average yield of straw per acre (pounds)
	1915	1914	1913	1911	1910	5-year average	
Poole	21.70	10.46	17.78	13.92	28.87	18.50	2,318
Fultz	20 20	13.90	17.96	9.30	24.43	17.16	2,355
Dawson's Golden Chaff	24.20	18.17	23.97	12.02	23.49	20.37	2,469
Gypsy	19.35	18.40	21.57	10.64	25.87	19.23	2,559
Nigger	26.59	13.51	20.35	9.53	21.54	18.30	2,399
Fulcaster	19.37	14.85	22.96	11.97	24.92	18.81	2,578
Mediterranean	21.87	14.57	24.26	11.19	28.48	20.07	2,667
Turkey Red	23.71	15.79	18.05	5.75	21.37	16.93	2,950
Velvet Chaff	17.87	15.29	14.52	10.25	23.37	16.26	2,463

Alfalfa.—In 1909 eight plots were treated with lime and fertilizers as indicated in Table LXXVII, except that Plot 7 received a little nitrate of soda and less muriate of potash, and were seeded to alfalfa. An unsatisfactory crop was harvested in 1910. The plots were plowed up and reseeded in 1912 without additional treatment of lime and fertilizers. During the winter of 1913-14 they were limed again, and in the spring of 1914, fertilized as indicated in the table. The yields for the years 1913, 1914 and 1915 are recorded.

As a 3-year average comparison of Plot 1 with 3, the burned lime has seemed to add less than 200 pounds to the yield of alfalfa; though when Plots 2 and 7, and 4 and 8 are compared, it seems to have added 986 and 874 pounds, respectively. Limestone on Plot 5 seems to have been worth 1,210 pounds of alfalfa more than burned lime on Plot 1, and nearly as much as lime and manure on Plot 4.

TABLE LXXV.—Alfalfa test, Hancock County Experiment Field

Plot	Treatment per acre	Total yield of 3 cuttings (pounds per acre)			
		1915	1914	1913	3-year average
	SECTION K				
1	Lime, 2000 lb	6,792	5,139	6,080	6,004
2	Lime, 2000 lb.; steamed bone, 300 lb	7,544	6,363	8,400	7,436
3	None	6,216	4,896	6,400	5,837
4	Lime, 2000 lb.; manure, 8 tons	8,632	6,246	7,080	7,319
	SECTION L				
5	Limestone, 4000 lb	8,229	5,412	8,000	7,214
6	None	7,139	4,296	7,420	6,285
7	Steamed bone, 300 lb.; muriate potash, 75 lb	7,521	4,188	7,640	6,450
8	Manure, 8 tons	8,284	4,260	6,790	6,445

While there are some contradictions in this test, it is apparent, on the whole, that the maximum yield of alfalfa cannot be secured on this soil without the addition of lime compounds, and that phosphorus and manure without lime are not sufficient.

THE TRUMBULL COUNTY EXPERIMENT FARM

FIRST ANNUAL REPORT, FOR THE YEAR 1915

M. O. BUGBY, AGENT IN CHARGE
CARL RUNKLE, FARM FOREMAN

The Trumbull County Experiment Farm was authorized at the election in November, 1914, a bond issue of $20,000 being approved for the purpose; and the following spring selection was made of a farm of 153 acres lying about 2 miles west of Cortland. The soil of this farm is the light, silty clay or clay loam characteristic of the Volusia series. The land lies exceptionally level, and was in urgent need of drainage, which was immediately begun. The season of 1915 was devoted to this and other lines of preparation.

M. O. Bugby, the county agricultural agent, was appointed superintendent of the experiment farm.

The following plan of management was approved by the county agricultural society:

PROPOSED PLAN OF MANAGEMENT

Soil fertility.—As the maintenance and increase of soil fertility will influence, to a great extent, future crop production, it is proposed to devote a considerable portion of the farm to investigations for Trumbull County requirements. These will consist of experiments to determine the effects of different kinds, quantities and combinations of fertilizers, alone and in combination with farm manure and with and without lime.

Tile drainage.—No doubt a large portion of the farm lands in Trumbull County must be tile-drained before maximum crop production can be obtained. To determine the most desirable depth and the distance apart to lay the tile and the length of time necessary for the increased crops to pay for the initial cost of draining, will be the purpose of the experiment.

Rotation systems.—It is proposed to devote several acres to various rotation systems of farm crops with a view to ascertaining which of the various systems are best adapted to local conditions.

Variety tests.—It is now an admitted fact that one of the best means of increasing crop production is to grow varieties of crops adapted to local soil and climatic conditions; therefore, a considerable part of the farm will be devoted to making variety tests of the leading crops. When the highest yielding varieties for the locality have been found, they will be multiplied and distributed among the farmers of the county.

Alfalfa experiments.—Alfalfa is now generally recognized as a plant of great value, both from the standpoint of yield and as a supplemental feed for corn. Experiments will be made to ascertain whether it can be successfully grown on Trumbull County soils.

Dates and rates of seeding.—It is proposed to make a trial of different dates and rates of seeding various farm crops.

Forage crops.—Considerable attention and space will be devoted to the economical production of maximum amounts of forage for cows from corn silage and other forage crops.

Pasture experiments.—Considerable attention will be given to increasing the productive capacity of pasture land.

Dairying and animal husbandry.—Dairying is a prominent feature of farm operations in Trumbull County. One of the vital questions in the dairy business is how to maintain a perfectly healthy herd and at the same time to have a profitable herd. For the study of these problems it is proposed to start with a small herd of cows. At a later date, should conditions warrant, some work will be carried on with hogs and poultry.

Orchard work.—It is proposed to maintain in a healthy, productive condition a small family orchard consisting of several varieties of apples, plums and cherries.

Farm management.—In cooperation with the county agricultural agent, in his other work, the farm will be devoted to discovering, developing and introducing the most practicable and profitable systems of farming for Trumbull County.

Respectfully submitted,
CHAS. E. THORNE,
Director, Ohio Agricultural Experiment Station

Approved by the Trumbull
County Agricultural Society
J. R. MUNSON, *President*
GEO. BUNTING, *Secretary*
Aug. 17, 1915.

COMPARISON OF VARIETIES

DEPARTMENT OF AGRONOMY

Corn.—Ten varieties of corn were tested for their yield of grain and stover. The yield per acre as determined by the fall weight at husking is given as well as that determined when the corn was fully dry. It will be noted that the three varieties ranking highest by the fall weights are the three highest by the air-dry weights, though in reverse order. The variation in yield among the 10 varieties is quite wide, as also the variation in shrinkage.

TABLE LXXVI.—Comparison of varieties of CORN, Trumbull County Experiment Farm

Variety	Yield of grain per acre (bushels)		Yield of stover per acre (pounds)
	As weighed in fall	Air-dry weight	
Swisher's White	30.02	27.19	2,561
Yellow Dent (Local)	22.75	18.50	1,894
Leaming (Frost)	40.63	31.37	3,763
Leaming (Wooster)	46.68	38.44	3,465
Ohio 84	46.44	39.20	3,302
Medina Pride	44.97	36.11	3,302
White Cap	45.88	39.67	3,285
Darke County Mammoth	40.39	29.10	4,950
Flint	34.33	31.45	2,936
Clarage (average 4 plots)	42.05	36.68	3,402

A test of seven varieties of corn for use as silage was conducted. Owing to late planting and the cool season the yields are not large, ranging from 6.04 tons with the common field corn sorts, to 10.37 tons with the large and late-maturing Eureka. Further tests will be required before any valuable information will be available.

TABLE LXXVII.—Comparison of varieties of SILAGE CORN, Trumbull County Experiment Farm

Variety	Yield per acre
	Tons
Clarage	6.04
Leaming (Frost)	6.80
Darke County Mammoth	7.87
Reid's Yellow Dent	7.49
Old Virginia	8.95
Eureka	10.37
Blue Ridge (Check) (average 4 plots)	8.80

Oats.—Thirteen varieties of oats, and one each of barley, spring wheat and emmer were tested. The oats standing highest are the Burt, Joanette, Silvermine and Ohio 201.

The other spring cereals gave much lower yields than the oats.

TABLE LXXVIII.—Comparison of varieties of OATS, Trumbull County Experiment Farm

Variety	Yield per acre		Weight per bushel
	Grain	Straw	
	Bu.	Lb.	Lb.
Ohio 7009 (Sixty Day)	38.95	1,250	33
Burt	48.01	1,490	35
Ohio 6203 (Siberian)	43.27	2,560	35
Ohio 201 (Siberian)	46.19	2,450	30
Big Four	43.48	1,820	35
Ohio 6222 (Improved American)	40.04	3,180	31
Silvermine	46.87	1,945	36
Swedish Select	44.48	1,605	33
Storm King	43.53	2,950	35
Joanette	47.02	2,070	35
Golden Rain	43.89	1,710	35
White Russian	36.29	2,150	34
Wideawake	44.73	2,144	34
Oderbrucker barley*	10.42	2,350	....
Emmer*	22.12	2,200	....
Groff spring wheat*	7.50	1,850	.....

*Very dirty.

A rate of seeding test was conducted with oats in which rates ranging from 6 to 14 pecks of seed per acre were used. The rate giving the highest yield was 10 pecks, with 9 pecks second, 8 pecks third and 11 pecks fourth. While the weights of straw were taken, the uneven weed growth makes these weights of little value.

TABLE LXXIX.—Rate of seeding OATS, Trumbull County Experiment Farm

Rate per acre (pecks)	Yield per acre
	Bushels
Six	22.19
Seven	24.69
Eight	28.12
Nine	29.37
Ten	33.12
Eleven	27.72
Twelve	25.31
Thirteen	23.44
Fourteen	25.31

Soybeans.—Seven varieties of soybeans were tested as recorded in the following table. The Ebony stands highest in yield of beans, with the Chestnut second, and Ohio 9100 third.

TABLE LXXX.—Comparison of varieties of SOYBEANS, Trumbull County Experiment Farm

Variety	Color of beans	Yield per acre Average 2 plots of each	
		Beans	Straw
		Bu.	Lb.
Chestnut	Yellow	18.09	2,750
Ebony	Black	23.45	3,080
Ohio 9100	Yellow	16.95	2,085
Ohio 9016	Yellow	11.31	1,720
Ohio 7476	Yellow	14.56	3,990
Ohio 7496	Yellow	16.38	3,062
Medium Green	Green	13.56	2,245

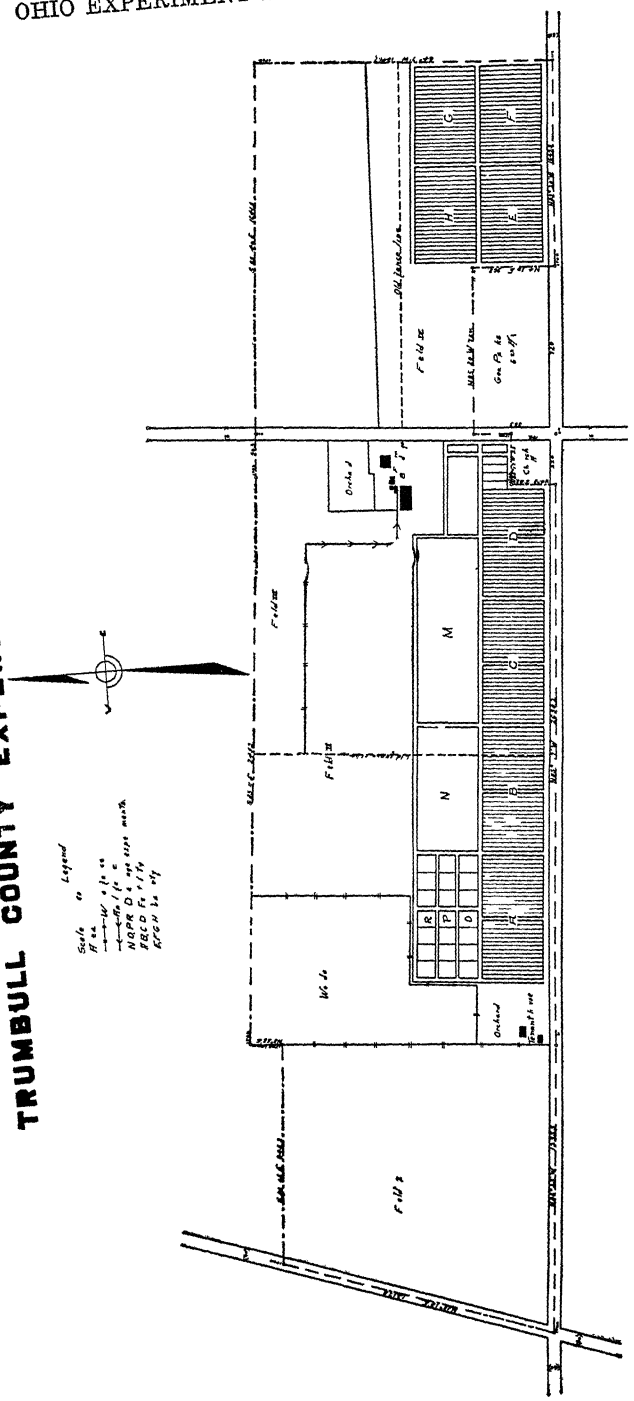


Diagram XVI.—Plan of Trumbull County Experiment Farm.

Fig. 15.—Residence on the Trumbull County Experiment Farm.

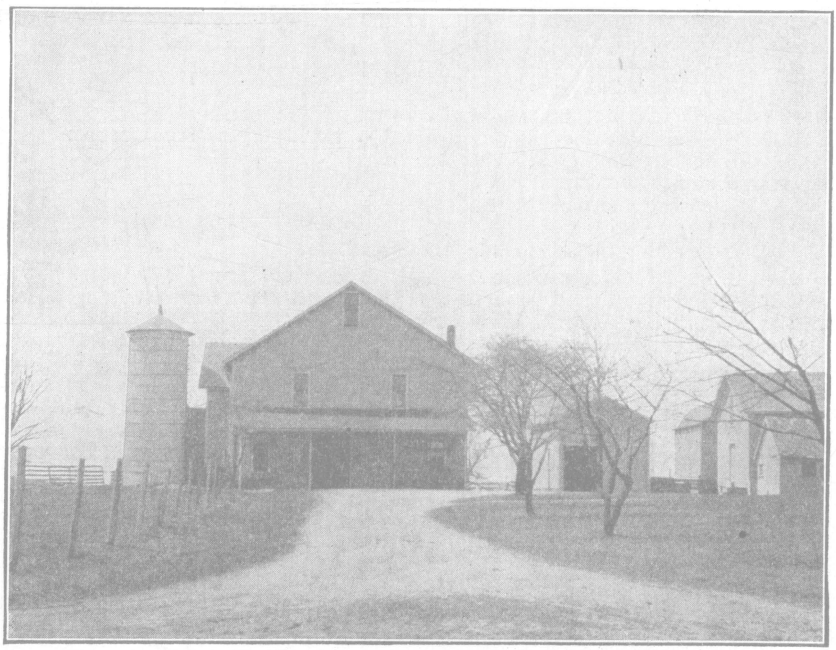


Fig. 16.—Barn on the Trumbull County Experiment Farm.

THE MAHONING COUNTY EXPERIMENT FARM

FIRST ANNUAL REPORT, FOR THE YEAR 1915

D. W. GALEHOUSE, AGENT IN CHARGE
JOHN FOLLWEILER, FARM FOREMAN

At the November election in 1914 a bond issue of $40,000 was authorized for the purchase and equipment of a county experiment farm in Mahoning County; and the next spring a farm of 274 acres lying west of the fairground at Canfield, was selected for this purpose. There proved to be a slight defect in the title to this farm, necessitating court proceedings, so that possession was not obtained until September.

D. W. Galehouse was appointed superintendent, and the work of preparing the farm for its purpose was begun in the fall.

The following plan of management was approved by the county agricultural society:

PROPOSED PLAN OF MANAGEMENT

During the spring of 1915 the director of the Ohio Agricultural Experiment Station held an informal conference with the Mahoning County farmers in the courthouse at Youngstown for the purpose of learning the problems of the Mahoning County farmers and a discussion of what projects should be inaugurated on the Mahoning County Experiment Farm.

The consensus of opinion seemed to be that the following are the problems of most importance:

1. Maintaining and increasing soil fertility.
2. Rotation of crops.
3. The varieties of cereals best adapted to the locality.
4. Trucking systems and the profitable marketing of truck crops.
5. Orcharding and small fruit growing.
6. Dairying.
7. Improving the pasture lands.
8. Poultry raising.
9. Beautifying the home and farmstead.

As the funds for this work are limited, it is not possible to start projects for the solution of all the questions the first year. Therefore, it is proposed to take them up in the order of their importance.

First and foremost is the question of soil fertility. It is proposed to have a number of one-tenth-acre plots and apply thereon different kinds and quantities of fertilizers and lime, not only for the purpose of increasing the crop yields but also to determine the most profitable yield. The effect of tile drainage on the yield will be studied.

It is proposed to devote a number of plots to testing varieties of the various cereal crops grown in Mahoning County.

A number of rotations will be started with a view of determining not only the gross receipts but also the net receipts and the distribution of labor. What legume crops are best suited to Mahoning County soils and systems of farming, will also be studied.

Truckers have been lavish in the use of manure, but the supply of manure available at present is not what it was in the past. It is proposed to devote a number of plots to determining whether a combination of cover crops and

fertilizers will not be a more economical method of growing truck crops than the use of so much manure. It is also proposed to compare varieties of truck crops.

With the truck and fruit crops grown it is proposed to study methods of preparing produce for market and distribution.

It is proposed to put out a variety orchard for the purpose of determining the varieties of tree fruit best adapted to Mahoning County conditions. It is also proposed to have an orchard devoted to cultural methods and also to intertilled crops for the purpose of determining whether revenue can be obtained from the land while growing the trees to a bearing age.

It is proposed to start with a small herd of dairy cows and to breed up a profitable producing herd and to maintain a healthy herd; also to determine the most profitable cow feeds to grow in Mahoning County.

It is proposed to fertilize and lime the pasture in various ways in order to determine the best method of growing a more nutritious and greater quantity of herbage.

Respectfully submitted,
CHAS. E. THORNE,
Director, Ohio Agricultural Experiment Station

Approved by the Mahoning
County Agricultural Society
W. F. DICKSON, *President*
EDWIN R. ZINGER, *Secretary*
April 3, 1916.

On the Mahoning County Experiment Farm there were planted in the spring of 1916 orchards comprising 49 varieties of apples and 12 of peaches. In the culture plots 324 apple trees will be used. The total number of apple trees will be 412 and peach trees 120.

A series of plots in which the rotation is strawberries, potatoes and vegetables has been started. The fertilizers used on these plots are the same as for the potato-wheat-clover rotations on the Clermont and Hamilton County Experiment Farms.

The same series of soil fertility plots and of soil improvement plots is planned for this farm as for the Washington County Truck Farm, but the experiments could not be started this year, as the land is in need of preparation.

SUMMARY OF EXPERIMENTS WITH FERTILIZERS AND VARIETIES

In Table LXXXI the principal results of the experiments with fertilizers on all the farms are arranged in such manner as to show the comparative effect of phosphorus used alone, or with potassium, or with both potassium and nitrogen.

In every case excepting at the Paulding County Experiment Farm, acid phosphate has produced a remarkably profitable increase of crop. The larger quantity of acid phosphate used in the more recent experiments has not yet produced increase of crop proportionate to the quantity applied, as compared with the results at Wooster and Strongsville, but in these tests the increase was only 4 bushels of corn in both tests and less than 2 bushels of wheat at Wooster and 5½ bushels at Strongsville during the first 5 years of the test.

The average increase of corn in the 12 tests has been 5¼ bushels, obtained for an average application of 152 pounds of acid phosphate. The average increase of wheat has been 5⅔ bushels for an average application of acid phosphate of 157 pounds.

The addition of an average of 50 pounds of muriate of potash has increased the average yield of corn in the 12 tests by a little more than 2½ bushels, and that of wheat by 1⅓ bushel—in either case enough to cover the additional cost of the fertilizer, corn being rated at 50 cents per bushel, wheat at $1, and muriate of potash at 2½ cents a pound, and taking no account of the residual effect of the fertilizer upon subsequent crops in the rotation.

When nitrate of soda has been added to the combination of acid phosphate and muriate of potash, at an average rate of 63 pounds per acre on corn and 83 pounds on wheat, the additional increase has averaged about 1½ bushel of corn and 2 bushels of wheat, not sufficient in either case to cover the cost of the nitrate. In fact, the only cases in which there has been a clear profit in the corn or wheat alone from the addition of nitrate of soda have been on the Wooster and Clermont soils, both of which had been depleted by exhaustive husbandry before the experiments were begun.

In the foregoing estimates no account has been taken of the stover and straw nor of the residual effect of the fertilizers upon subsequent crops in the rotation. Experience has shown that the residual effect is considerable, and that in a systematic use of fertilizers or manure on crops grown in rotation an increasing rate of gain may be expected as the work progresses.

TABLE LXXXI.—Summary of experiments with fertilizers on CORN and WHEAT. Average annual increase in bushels per acre

Station	Duration of tests	Corn				Wheat			
		Phosphorus[1]	Phosphorus and potassium[2]	Phosphorus, potassium and nitrogen[3]	Manure (per ton)	Phosphorus[1]	Phosphorus and potassium[2]	Phosphorus, potassium and nitrogen[3]	Manure (per ton)
	Years								
Wooster, 5-year rotation	22	7.95	14.97	18.81	3.27	8.00	9.19	16.20	1.74
Strongsville, 5-year rotation	21	7.70	9.58	11.72	1.86	8.18	9.74	11.15	1.09
Germantown, 3-year rotation	12	7.02	12.15	13.78	2.87	4.85	6.20	8.77	1.33
Carpenter, 3-year rotation	12	8.06	9.28	12.87	2.40	5.19	7.04	9.86	1.46
Findlay, 4-year rotation	7	4.44	8.72	7.71	2.28	5.19	6.08	5.55	1.96
Miami County, 4-year rotation I	5	11.00	12.35	10.29	.....	10.16	11.11	10.95	..
Miami County, 4-year rotation II	5	7.64	9.91	5.14	.....	7.85	10.50	13.71	..
Miami County, 4-year rotation III	5	9.70	12.25	11.75	.....	.....	.....	.....	.....
Paulding County, 4-year rotation I	4	— 4.26	— 6.31	— .02	.....	— 4.40	— 2.36	4.58	.....
Paulding County, 4-year rotation II	4	— 4.75	— 5.35	2.21	.....	5.28	5.22	7.45	.....
Clermont County, 4-year rotation	4	5.32	7.64	12.40	.....	3.44	4 83	9.11	.....
Hamilton County, 4-year rotation	3	3.68	9.29	6.13	2.08	8.55	9.47	10.38	1.17

[1]Carried in 14 percent acid phosphate, used at the rate of 80 pounds per acre on corn and 160 pounds on wheat at Wooster and Strongsville, 120 pounds on each crop at Germantown, Carpenter and Findlay, and 200 pounds on each crop at the county experiment farms.

[2]Carried in muriate of potash, used at the rate of 80 pounds per acre on corn and 100 pounds on wheat at Wooster and Strongsville, 20 pounds on each crop at Germantown, Carpenter and Findlay, and 50 pounds at the county experiment farms.

[3]Carried in nitrate of soda, used at the rate of 80 pounds per acre on corn and in the equivalent of twice that quantity on wheat at Wooster and Strongsville (50 pounds dried blood in the fall and 120 pounds nitrate of soda in the spring) 80 pounds on corn and the equivalent of that quantity on wheat at Germantown, Carpenter and Findlay (20 pounds dried blood in the fall and 60 pounds nitrate of soda in the spring) and 50 pounds on each crop, all applied in the fall, at the county experiment farms.

TABLE LXXXII.—Leading varieties of cereals and soybeans at the experiment farms. Average yields in bushels per acre

Crop and variety	Wooster 10 years	Germantown 10 years	Carpenter	Hancock 4 years	Paulding 3 years	Miami 3 years	Clermont 3 years	Hamilton 3 years	Washington 2 years	Trumbull
CORN:										
Darke County Mammoth	84.85	63.03	60.81[10]	66.76	59.33	61.94	33.78	60.11	47.24	.....
Leaming	84.27	58.66	53.45[9]	70.29	59.05	57.10	32.86	56.45	41.27	.....
Cook's 75	.....	.....	.....	66.75	63.98	60.19	31.60	60.83	.....	.....
Ohio 84 (Early Reid)	82.18	55.00[9]	52.12[8]	65.50	57.25	53.68	....	49.01	44.54	.....
Boone County White	.....	60.34	51.55[9]	70.07	.....	66.56	.....	.....	.....	.....
Clarage	76.71	53.79	48.90[10]	60.96	62.19	60.52	31.71	54.58	44.69	.....
White Cap	76.52[7]	.....	.....	.....	.....	57.73	28.22	52.25	.....	.....
Reid (Orcutt)	80.23[8]	.....	.....	.....	61.00	59.44	35.11	58.72	49.34	.....
OATS, BARLEY AND EMMER:			5 years	5 years	4 years	4 years	3 years	3 years		1 year
Big Four	.....	.....	.....	44.21	60.99	64.70	25.57	42.85	.....	43.48
Silvermine	.....	.....	.....	45.47	55.94	60.50	23.00	43.21	.....	46.87
Swedish Select	.....	.....	.....	41.53	.....	59.57	18.98	33.62	.....	44.48
Sixty Day	.....	.....	32.78	36.44	54.88[3]	57.96	29.95[2]	36.04	.....	38.95
Ohio 6203 (Siberian)	.....	.....	28.77	43.78	56.67	62.09	22.04	30.90	.....	43.27
Ohio 6222 (Improved American)	.....	.....	.....	43.55[3]	63.25	63.18	18.98	36.91	.....	40.04
Wideawake	.....	.....	26.56	39.95	52.38	59.37	21.68	36.33	.....	44.73
Oderbrucker barley	.....	.....	12.55	16.90[3]	37.97[3]	31.94	.. ..	17.57	.. ..	10.42
Emmer	.....	.....	18.65	28.16[4]	.....	39.85	.....	22.92	.....	22.12

Note—superior figures refer to years of test.

TABLE LXXXII.—Leading varieties of cereals and soybeans at the experiment farms. Average yields in bushels per acre—Concluded

Crop and variety	Wooster 8 years	Germantown 6 years	Carpenter 6 years	Hancock 5 years	Paulding 3 years	Miami 3 years	Clermont 2 years	Hamilton 2 years	Washington	Trumbull
WHEAT:										
Fulcaster	33.20	20.35	.....	18.81	.....	.....	.....	.....	.....	.....
Fultz	34.63	24.75	27.11	17.16	.....	34.18	.....	.....	.....	.....
Trumbull	37.06	27.85	28.89	.....	43.42	39.22	.....	.....	.....	.....
Ohio 8106 (Fultz)	34.06[4]	.....	.....	.....	.....	34.90	.....	26.31	.....	.....
Poole	36.06	27.73	27.19	18.50	.....	35.69	.....	.....	.....	.....
Portage	39.78	30.69	31.42	.....	41.80	41.48	19.09	27.04	.....	.....
Gypsy	33.99	28.18	26.95	19.23	.....	37.60	.....	.....	.....	.....
Gladden	37.62	29.58	28.31	.....	43.12	38.48	17.48	25.48	.....	.....
Mediterranean	32.99	21.74	26.52	20.07	32.80	34.96	17.76	23.71	.....	.....
Rudy	34.65	22.13	25.28	.....	37.38	37.41	15.15	.....	.....	.....
Turkey Red	29.07	19.55	22.79	16.93	41.27	35.53	10.15	23.95	.....	.....
Valley	35.09	21.50	26.58	.....	.....	39.62	.....	.....	.....	.....
Goens	34.51[3]	.....	.....	.....	33.06	39.75	.....	22.01	.....	.....
Nigger	35.53	24.03	26.76	18.30	42.04	37.93	18.51	26.65	.....	.....
Velvet Chaff	31.16	23.29	25.36	16.26	37.81	36.13	16.12	24.23	.....	.....
Red Wave	36.29	.....	.....	.....	.....	.....	.....	28.02	.....	.....
Dawson's Golden Chaff	38.31	21.67	.....	20.37	.....	.....	.....	.....	.....	.....
SOYBEANS AND COWPEAS:	4 years				2 years	3 years	1 year	3 years	1 year	1 year
Ohio 9100	21.92	.....	.....	.....	18.78	17.19	2.78	13.97	17.34	16.95
Mongol	25.95	.....	.....	.....	17.37	21.83	7.62	16.72	18.68	.....
Chestnut	28.39	.....	.....	.....	25.00	22.26	5.95	14.38	17.73	18.09
Ohio 9035	25.58	.....	.....	.....	22.42	22.46	6.84	16.05	22.57	.....
Ebony	25.19	.....	.....	.....	18.14	18.44	6.23	17.06	11.40	23.45
Ohio 7496	29.86	.....	.....	.....	19.95	23.96	.....	16.57	.....	16.38
Ohio 9016	31.19	.....	.....	.....	17.50	21.69	.....	13.39	.....	11.31
Medium Green	22.71	.....	.....	.....	13.73	20.88	7.12	12.71	11.62	13.56
Ohio 7476	.....	.....	.....	.....	.....	.....	.....	.....	.....	14.56
New Era cowpeas	7.33	.....	.....	.....	.....	7.07	.....	4.47	1.50	.....

Note—superior figures refer to years of test.

This is especially true of barnyard manure. In the 5-year rotation at Wooster common, open-yard manure has been applied to corn and wheat at the rate of 8 tons per acre on each crop on Plot 18 and 4 tons on Plot 20. If we disregard the stover and straw and compute corn at 50 cents per bushel, oats at 40 cents, wheat at $1 and hay at $10 per ton, the direct and residual effects of this treatment for the 20 years, 1894-1913, will be shown in Table LXXXIII.

TABLE LXXXIII.—Direct and residual effect of barnyard manure

Crop	8 tons per acre				4 tons per acre			
	Increase per acre		Value of increase		Increase per acre		Value of increase	
	Direct	Residual	Direct	Residual	Direct	Residual	Direct	Residual
Corn	23.78 bu.	.....	$11.89	$.....	14.31 bu.	.....	$7.15	$.....
Oats	.....	11.95 lb.	.....	4.78	.....	7.23 bu.	.....	2.89
Wheat	11.85 bu.	.....	11.85	.....	7.76 bu.	.....	7.76	.....
Clover	.....	2,082 lb.	.....	10.41	.....	1,138 lb.	.....	5.69
Timothy	.....	1,537 lb.	.....	7.68	.....	983 lb.	.....	4.91
Total values	.....	.....	23.74	22.87	.....	.....	14.91	13.49

Table LXXXIII shows that at both rates of application the residual effect of the manure has been nearly as great as the direct effect, on the basis of prices used in this computation. Of course, a different scale of valuations would alter the outcome.

TABLE LXXXIV.—Direct and residual effect of chemical fertilizers

Crop	On corn and wheat				On wheat only			
	Increase per acre		Value of increase		Increase per acre		Value of increase	
	Direct	Residual	Direct	Residual	Direct	Residual	Direct	Residual
Corn	16.07 bu.	.....	$ 8.03	$.....	.....	7.44 bu.	$.....	$3.72
Oats	.....	8.76 bu.	.....	3.50	.....	3.64 bu.	.....	1.45
Wheat	14.44 bu.	.....	14.44	.....	13.72 bu.	.....	13.72	.....
Clover	.....	1,042 lb.	.....	5.21	.....	749 lb.	.....	3.74
Timothy	.....	629 lb.	.....	3.14	.....	401 lb.	.....	2.00
Total values	.....	.....	22.47	11.85	.....	.....	13.72	10.91

It is interesting to study the effect of chemical fertilizers in the same way. Table LXXXIV gives the outcome of a 20-year application of a fertilizer made up of nitrate of soda, acid phosphate and

muriate of potash, applied on Plot 14 to corn and wheat, and on Plot 15 to wheat only, the rate of application being a little larger for wheat than for corn, but the same for wheat on both plots.

Table LXXXIV shows that the fertilizer, which has cost, at prices prevailing before the European War, an average of $7.45 for the corn crop and $8.60 for the wheat, or $16.05 for the two crops, has produced nearly as large a direct increase as 16 tons of yard manure—8 tons on each crop—but that the residual increase from the fertilizer has been but little more than half as great as that from the manure. When the fertilizer has been used only on wheat the residual increase, which has extended through the four crops following, has been relatively larger than when both crops were fertilized, amounting to 80 percent of the direct increase.

In considering this outcome it must be remembered that the 16 tons of manure has carried a much larger quantity of the fertilizing elements—nitrogen, phosphorus and potassium—than has been carried in the fertilizer. The difference in outcome has been due to the more ready availability of these elements in the fertilizer.